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GAS INVESTORS AND GAS INVESTMENTS.

The people of this country, as a general rule, are inclined to regard the owner of gas shares as an exceptionally fortunate individual, and, in their prejudiced way of estimating, seem to consider that gas companies and gold mines are about identical—that is, in respect of the ease with which fabulous returns are received in proportion to the original investment amounts made. Unluckily, it is an unquestionable fact that every glittering object cannot be smelted into a fine gold; and we are not quite so sure but that, after all, the people are right in their conclusion, at least in a measure, concerning the analogy which, according to them, exists between gas shares and gold mines. If a complete compendium of all legitimate gold mining ventures could be prepared we opine that a rather remarkable document would be spread before us, and its contents would likely reveal the fact that the failures kept pretty even pace with the successes met with in the search for one of the most precious of earth's treasures. Such sort of supposition possibly brings us close to the point where we must confess, then, that gas shares are even better than gold mines; and, take it all-in-all, we do not know but what we must concede to a leaning towards the latter idea ourselves. Gold bearing lodes, be they ever so prolific, in the end must pinch out, but the gas bearing vein, if properly worked, grows more productive as its age advances.

But the question of how to properly work the gas field is one, as may well be expected, regarding which a most diversified style of opinion exists. Although it is to be credited to the common sense of gas shareholders that they are now seemingly in a fair way to arrive at a uniform scale of practice in the conduct of their business. Common sense is often dearly bought, but no matter what be the figure at which it was finally purchased, the bargain was a valuable one, and likely to recoup the purchaser in the long run. It is not many years ago, certainly not over a decade and a half, when most of the proprietors of American gas undertakings insisted that the last cent available should be extracted from the purses of those whom they attempted to serve. It is all very well to say that hay should be made while the sun shines, and no doubt the sun's good offices should be availed of; but the sun does not always shine. And, worse yet, the sun of yesterday will not answer for curing the grass that is to be cut to-morrow. Nor will the sun of public opinion lose any of its strength if the darkened glass of concession be occasionally held aloft by the husbandman of the gas field.

Especially within the past ten years has the holder of gas shares had much reason to hearken to the voice of those who counselled moderation in gas prices, and whose admonition was put forth, not because they did not wish to reap a golden harvest, but because they preferred a steady downfall of silver pieces rather than succumb to the blandishments of a sudden and all too uncertain shower of gold. The golden shower invited the attention of those who thought a less valuable metal would compensate them for their trouble in attempting to effect a transmutation that seemed easy to their senses. The transmuters were right in many instances; and those who refused aught but gold have since, because of the fondness of others for silver, been perforce obliged to put up with copper. In time, no doubt, they will get back to the silver basis, but there never was any reason why (except their own cupidity be accepted

as such) they should have been obliged to pass a penitential season or so in the coppery realms at all.

We may be pardoned possibly for calling attention to the stand always maintained by the JOURNAL, and when we say the JOURNAL we mean to include with ourselves the majority of our engineers, in this regard. It is not so long ago that many hard words were launched at us for our continued hammering at high gas prices; but the blows of the hammer seem only to have been expended with the result of knitting our fiber more closely together. After all, the result was inevitable, and the only real credit that we take to ourselves is that we were a trifle ahead of our time.

Our readers need not be told here of how firmly seated is the desire of all to get down to bottom selling rates, for our news columns tell the story most eloquently; and, best of all, they will continue to narrate a similar tale. Many gas share proprietors, whose holdings amounted to control in their respective companies, were hard to convince, but the leaven, from one cause or another, has permeated them at last, and for their own good. The financial records for the year just closed, even though they are not, as a rule, favorable to investors and investments in railroad shares and general manufacturing stocks, show how well the policy of concession to the public has repaid the holder of gas shares. And despite the competition to which the art of the gas maker is to be opposed, let that competition assume whatever form it may, the gas stock investor may rest easy in the assurance that his bread will continue to come to him in undiminished quantity and quality, provided he keeps pace with the practice that finally led him into green and peaceful pastures.

THE METER COMPANY ANNUALS.

Our readers will perhaps recollect that, at the New York meeting of the American Association, when the committee on President Greenough's address handed in their report, an animated discussion arose as to the advisability of putting into effect the recommendation of the President in respect of the appointment of a permanent Committee of Investigation, to whom gas men throughout the country could refer for a solution of any perplexity that might arise in their daily business experience as gas makers. One of the gentlemen who took part in the debate gave it as his opinion that the indorsement of such a project would seriously interfere with the bread earning resources of those who offered their services to their fellows as consulting engineers. We are free to confess that such argument did not carry much weight with us as a valid objection to the Greenough proposition, but if it did strike us favorably we would now be impelled to cry out against the meter companies in their practice of distributing annuals amongst the gas men of the country. But as it was with us in regard to the objection made in October by an opponent of the Greenough plan, so also does January discover us in the matter of the excellent technical literature now being disseminated by the meter companies, and contained between the covers of their pocket diaries for 1888. We are moved to this introductory strain chiefly because a certain publisher of technical gas literature a few days ago, within our hearing, bewailed sadly the practice of the meter men. In attempting to console him we remarked that his sorrow should be at once changed to gladness, for the "wider dissemination of useful knowledge" ought to immediately increase the demand for his books. Candor compels the admission that he yet remained doleful, seemingly far from convinced that our argument was trustworthy, or even meritorious. However, his grief cannot change the fact that the handsome pocket annuals, specimens of which have been received by us from the American Meter Company, Helme & McIlhenny, and Messrs. Harris, Griffin & Co., are now either adorning the desk or occupying the pocket of every gas engineer in the country; and we expect that their receipt has been welcomed most warmly.

The American Company's "Pocket Almanac" has been greatly furbished up during the year, and it is really now nothing less than a handy reference book. In addition to the usual features of well-calculated tables announcing the times for lighting and extinguishing public lamps in places where a moon-table is adhered to, we note that a second table giving the New York city schedule of all-night lighting is furnished this year.

Under the heading of "Rules and Data" some 36 pages of valuable information is succintly presented, the matter whereof was collated and edited by a gentleman well calculated to perform the task thoroughly. The editor is no less an authority than Mr. Wm. Mooney. In short, the "Pocket Almanac" is a veritable gem. Very great improvement is also to be noted in the "Helme & McIlhenny Lighting Calendar and Pocket Memorandum Book" for current year. The lighting tables are very neatly and clearly printed, and the engineer who has occasion to consult them hurriedly will have to be very near-sighted if he feels called upon to adjust his spectacles for the occasion. Messrs. Harris, Griffin & Co.'s "Pocket Almanac" for 1888 is another mine of technical information, the chapters thereof being put together with cleverness and method. The meter companies are really to be congratulated on their enterprise, and we think their efforts in this respect are duly appreciated by every gas engineer in the country.

1888 ALLOTMENT OF PAPERS, SOCIETY OF GAS LIGHTING.

Papers to be read at the monthly sessions of the Society of Gas Lighting during the current year have been assigned in accordance with the following:

January.—Messrs. Armington and Hallett.
February.—Messrs. Benson, Forstall and Taber.
March.—Messrs. Coggeshall, Greenough and Stedman.
April.—Messrs. Mooney, Humphreys and McMillin.
May.—Messrs. Smith, Lamson and Crockett.
June.—Messrs. Flemming and Nettleton.
July.—Messrs. Thomas and Sherman.
September.—Messrs. Vanderpool and Sabbaton.
October.—Messrs. Strecker, Stiness and Turner.
November.—Messrs. Slater and Wood.

PERSONAL.

On December 30th Mr. A. W. Schleicher, of Messrs. Schleicher, Schumm & Co., Phila., Pa., sailed for Europe, per the French liner La Champagne. The object of his journey is to post himself thoroughly on the expert testimony furnished by those German scientists who testified in the famous suits brought by Dr. Otto, and to personally witness experiments made by them in support of the Doctor's theories. Mr. Schleicher will also acquaint himself with the progress made in the manufacture and application of the Otto engines in England, Germany and France. We wish him all possible success.

The Society of Arts' Motor Prizes.

It should not be forgotten that the prizes offered by the English Society of Arts for small power motors applicable to electric lighting are to be awarded on the results of a trial which is to take place in May or June of this year. The motors which may be entered for the prizes are portable, semi-portable, and detached steam engines, either condensing or non-condensing gas engines working with lighting gas, water gas, or producer gas; hydro-carbon engines, using either liquid or vapor hydrocarbon; water motors; compressed air and exhaustion motors. The maximum power at which they may be tested is 20-H.P., and no competition will be held unless 10 motors at least are entered. The points of merit considered of the greatest importance will be: (*a*) Regularity of speed under varying loads. (*b*) Regularity of speed during the various parts of one revolution, or one cycle of revolutions. (*c*) Power of automatically varying speed to suit arc lights. (*d*) Noiselessness. (*e*) First cost. (*f*) Cost of running. (*g*) Cost of maintenance. Further information can be obtained from Mr. H. Trueman Wood, Sec. of the Society of Arts, Adelphi, London, England.

THE IOWA INDIVIDUAL GAS LIGHT COMPANY.—Articles incorporating the Iowa Individual Gas Light Company have been filed with the proper authority. The projectors propose to construct a gas works in Council Bluffs, Iowa. Messrs. Ernest Riall, A. C. Powell, E. W. Pitkin, C. H. Brown, S. Theodore, Jno. L. McCague and A. M. Kitchen compose the Directorate. The officers for first year are: E. Riall, President; A. C. Powell, Vice-President; A. M. Kitchen, Treasurer; E. W. Pitkin, Secretary.

THE LATEST.—Official advices, dated Jan. 12, contradict the rumors that the men employed in the Hon. W. L. Scott's Ocean mines intend to quit work.

THE contract for excavating and walling a tank for a gasholder to be located at the Fifteenth Ward station of the Phila., Pa., gas works has been awarded to E. D. Smith. The Camden Iron Works will furnish the holder proper.

THE Batavia (N. Y.) Gas Company has elected the following directors: Wilber Smith, G. B. Worthington, H. N. Howard, D. W. Tomlinson, A. N. Cowdin, H. T. Miller and C. H. Dolbear. Wilber Smith was re-elected President, and A. N. Cowdin was chosen Secretary and Treasurer.

Fifty Years' Progress in the Manufacture of Coke.

Industries, in recapitulating the advances made in coke manufacture during the last half century, says:

The great industry of the manufacture of coke is one of comparatively recent origin. It may, indeed, be said to have almost entirely arisen within the last 50 years, although some kind of coke was made upward of a century ago. The commencement of this industry is involved in a good deal of obscurity. In 1765, however, it was carried on in the North of England to some extent, since the author of the "Voyages Metallurgiques" states that there were then "nine kilns at Newcastle, upon the edge of the river, to destroy the sulphur contained in the coal, and to reduce it to what is called cinders and coaks." At this time, however, the "coaks" were only intended for the production of mineral tar. Lord Dundonald established some coke ovens near Newcastle for this purpose; but he does not seem to have succeeded very well in his experiments. The first records of the manufacture of coke for the iron industry date from about 1827, when the Birtley Iron Works were supplied with coke produced from the Pontop Colliery Hutton seam. The growth of the iron manufacture in the same district a few years later brought about the modern development of the coke industry.

In the principal British coal fields the form of coke oven now chiefly employed is called the "beehive," from the fact that its shape is not unlike that structure. The oven is almost circular in plan, and has a dome-shaped roof. The coal is introduced into the oven by an aperture in the center of the dome. A tramway line is generally carried along the top of the line of coke ovens, enabling the coal-laden wagons to pass along the range of ovens overhead, and unload their contents automatically. The coal is burned in the ovens for a period varying from 48 to 90 hours, according to the character of the coal, the form of the oven, the quality of the coke required, and other determining circumstances. A large square aperture is made in the side of the oven after each charge is ready for drawing; and the coke is unloaded on to benches, where it is cooled by the application of a stream of water, which gives to the coke the necessary degree of hardness, and prevents it from crumbling. This is of the utmost importance in blast furnace practice, since the coke has to bear a heavy burden; and if it were too soft it would decrepitate, and the passage of the gases through the mass would be interfered with.

There is obviously an enormous waste of calorific power involved in cooling the coke in the way just referred to before using it in the blast furnace. It is extremely improbable, however, that the use of water can be avoided; and hitherto all attempts made to utilize the coke in the blast furnace while it still retains its initial heat have failed. Several processes have been suggested whereby some of this heat might be utilized, and in some cases, as in that of the Ferrie furnace (worked some years ago at the Monkland Iron Works, in Scotland), the coal was coked in the blast furnace itself, in chambers specially provided for the purpose. But the practical difficulties that have always attended these experiments have rendered their continuance or revival improbable.

Until the commencement of the present century charcoal was the fuel that was chiefly employed in the manufacture of pig iron. The reducing power of charcoal in the blast furnace is greater than that of coke; but in England, at any rate, and in most other countries as well, the quantity of charcoal available was limited by the denudation of the forests, and the imposition, in some cases, of ordinances forbidding their further depletion. The original plan adopted for the production of coke was that of burning the coal in open heaps. This was a crude and imperfect process, and the yield of coke was often not more than 40 per cent. of the coal used.

In the United Kingdom the most important coking districts are those of South Durham and South Wales. Coke is, however, made more or less in almost every coal field in the country, although in some districts the quality of the coal is not such as to adapt it for producing a coke suitable for metallurgical purposes. Sir Lowthian Bell has calculated that the quantity of coke annually produced in the South Durham coal field is about 6 million tons, requiring the services of over 2,000 coke drawers, etc. In South Wales the production of coke does not exceed 1 million tons; and in the rest of the country there may be produced some 2 million tons more—giving a total output of about 9 million tons. If we assume that the ovens enployed are worth, on an average, about £100 each, with accessory tools, etc., and if we take the total number of ovens employed at 20,000, the capital embarked in the trade will be something like £2,000,000 sterling. This is probably under the mark, seeing that there are now at work a considerable number of Simon-Carves and other patent ovens, which usually cost more than £100, and many cost £150.

Within the past four or five years the coke industry has taken a new departure. For many years—indeed, up to the present time—the valuable bye-products generated in the manufacture of coke have been allowed to go to waste. It has been generally supposed by smelters that coke made in patent ovens, where the bye-products were recovered and utilized, was of inferior quality; and the aim of the coke maker has been, above all things, to produce a good quality of coke, as otherwise the pig-iron makers and foundry owners sought their coke elsewhere.

The ovens which have found most favor with English coke makers besides the beehive have been the Appoel and the Coppee. The latter is the only oven that has come into large competition with the beehive in England. It is said to involve per ton of coke a labor cost of only 11d., as against 1s. 3d. in the beehive; to require only 8 minutes to empty and fill, as against 60 minutes in the beehive; to reduce the duration of the burning from 48 and 120 hours to 24 hours; and to involve a first cost of only £100, as against £119 7s. in the ordinary beehive. There are other advantages claimed for this system, such as the occupation of a smaller area per ton of coke produced per day, a higher yield, and a smaller area of outside cooling surface. The structural peculiarities of the Coppee oven are: The combination of all the hot gases in a large conduit beneath the ovens, and their utilization for heating the boilers; the combustion of the gas by a double admission of air, which entirely suppresses the smoke; a limited width; and an arrangement of channels specially suited for poor coal. The Coppee ovens have made more progress in South Wales than in any other British coal field; whilst in the North of England the beehive ovens are still supreme. In Germany and in Belgium the Coppee system is, however, very largely adopted. In both these countries it is believed that flued ovens, emptied by steam machinery, have great advantages over the ordinary beehive ovens, emptied by a hand rabble. In continental countries, moreover, hoppers and trollies are invariably employed to feed the ovens, instead of the old plan still pursued in many coke works in England, of throwing the coal through the doors by shovels; while with us a hook, actuated by hand, takes the place of the steam ram generally employed on the Continent.

It is, however, in the adoption of the Simon-Carves or other form of oven adapted to the utilization of the bye-products evolved from the distillation of the coal that the greatest revolution has occurred. This oven was formerly introduced to the notice of English coke makers at the meeting of the Iron and Steel Institute in May, 1880. The oven had been previously put to a practical test at the Besseges works in France. The object for which it was designed was a large and important one. It is calculated that in the Durham coal field alone some 2 million tons of volatile ingredients are given off in the form of tarry matter and hydrocarbons in the manufacture of about 6 million tons of coke, and that the same industry sends into the air from 60,000 to 80,000 tons of sulphurous acid, which should be capable of utilization. As a result of adopting the Simon-Carves system, it was claimed that about 4s. per ton of coke made could be recovered as useful bye-products; that the quality of the coke was purer, and the yield greater; and that there was an almost entire absence of smoke. The Messrs. Pease, of Darlington, were, we believe, the first to give the Simon-Carves system a trial in this country. After using the system for about two years they reported that the cost of a battery of 25 ovens had averaged £226 8s. per oven; that the cost of burning the coke, including all the labor connected with obtaining the bye-products, was 2s. 3.9d. per ton of coke; that the Simon-Carves system yielded 15 per cent. more coke; that the extra cost of labor per ton of coke produced over the ordinary beehive system was 1s. 3.3d., including the expenses connected with obtaining the bye-products; and that the quantity of products recovered amounted to 6.12 gallons of tar and 27.7 gallons of ammoniacal liquor per ton of coal. Sir Lowthian Bell, however, has not given such a satisfactory account of this oven for blast furnace purposes as could be desired; maintaining, in effect, that a large part of the coal saved in the oven is lost when the coke comes to be used in the blast furnace. The system yields excellent founders' coke; and it is making decided progress.

In the United States the coke industry has made remarkable progress within the last few years. In 1850 there were only four works producing coke in that country; and the total product was only a few thousand tons. Iron was then made either with charcoal, with mixed fuel, or with anthracite. Even in 1870 the number of coke works in the States was no more than 25; while the total value of the coke produced was returned at only £227,000. In 1880, however, coke was produced at 127 different works in America; the total value of the product being about £1,000,000 sterling, and the total quantity of coke produced being 2,752,000 tons. The census statistics of the production of coke in the United States give a good deal of information that may be useful in European coke work as regards the conditions and cost of production. Thus we find that 9,763 ovens were employed in 1880; and that the cap-

ital invested in the different coke works was £954,000—being roughly an average of under £100 per oven. The number of employees was 3,140; and as the total amount paid in wages was £240,000 over the year, it follows that each employee received rather more than £76 in wages. This is fully £16 per capita more than the wages paid for the same class of labor in England. The labor employed in coke works is, indeed, of a very ordinary kind; and it has always been contended by English coke makers that it should not rank in any sense as skilled labor. The quantity of coke made in the United States in 1880 having been 2,752,000 tons, it follows that each employee produced, on an average, about 876 tons, the cost of converting which amounted to an average of 1s. 10. per ton. Each oven produced an average of upward of 280 tons. The total value of the materials used in producing the 2,752,000 tons of coke was $2,995,000, or rather more than 4s. per ton. The total value of the coke produced is, however, returned at $5,395,000; and as the value of the materials and the cost of the labor employed unitedly come to $4,192,000, it is clear that $1,167,000 is the profit resulting from the manufacture—being equal to about 1s. 9d. per ton of coke produced.

One thing that strikes us as remarkable in these returns is the low cost of the coal employed. The 4,360,000 tons of coal used in producing the 2,752,000 tons of coke is returned as of the value of only $2,761,000, being a fraction over 2s. 6d. per ton. In the Durham coal field the coal employed in coke making is worth much more than this; and the product is usually sold for considerably more than 7s. 7d., which is approximately the official value of the coke made in the United States. It is also to be remarked that this is much above the average price at which coke has been sold in the United States since that date. During a great part of 1883 Connelsville coke was sold at 90 cents, or 3s. 9d., per ton. This is much less than the lowest price at which coke has been sold for blast furnace purposes in this country. America, indeed, has been found to possess both cheaper coal and coke at the places of production than the old country; but the long distance over which it has usually to be transported, in order to reach the place of consumption, has tended to neutralize this gain. The production of coke in America grows rapidly greater. In 1883, 5,460,000 net tons were produced; but although this production is believed to have been largely exceeded in 1886, it has not been equaled in the interval. In the United States, as in the United Kingdom, the form of oven employed is generally the beehive. Of the 10,116 ovens built in 1880, no fewer than 9,728 were of this pattern, 316 were Appoel or Coppee ovens, 30 others were of different patented forms, and 42 were in the form of pits or mounds.

Paper on the Patent Coal-Liming Process.

By R. P. Spice, C.E.

We are indebted to the author for a copy of a paper recently prepared by him in respect of the latest results gained in the operation of the patent coal-liming process. Mr. Spice says:

This process has entered on its fifth year of successful working at Tunbridge Wells, where the annual make of gas is now, in round numbers, 130 millions cubic feet. It is well on in its second year's stage of prosperous operation, and giving decided satisfaction, at the Folkestone Works, where the annual production is about 150 millions feet; and it is also employed with success at nine other works, using respectively from 5,000 to less than 300 tons of coal per annum, without the aid of machinery or any special appliances.

Its great value is felt most in those cases where the purifying plant was, previous to its introduction, too small for the quantity of gas made, even where lime only was the material employed; the difference being practically illustrated by the extended periodicity of the operation of opening the purifiers and changing their contents, the period being extended from once or twice a week with lime, on the old method of carbonizing, to once only in twelve months.

Four years' working has established the record that the purifier receiving the gas as it comes from the scrubber has been opened but once yearly during the four years ended on the 31st October last. That the small proportion of the oxide which has been removed was found to contain 84 per cent. of sulphur, and the first lot sent to market realized 24s. 6d. per ton, delivered into trucks on the railway siding upon the gas works, at the time that an offer could not be obtained for spent oxide containing only 45 per cent. of sulphur, which had been produced by working on the old method, when it was found to be unprofitable to continue its further use, owing to the cost of working it, exceeding the small additional value of the possible further accretion of sulphur.

As regards the quantity of oxide used, it is considerably reduced by the application of the process. This has been conclusively proved by the experience gained at Tunbridge Wells, for at the commencement of the use of the system there the stock of oxide was not in excess of current requirements on the old method of carbonizing; and to maintain that stock in its integrity fresh material must have been imported from time to time to replace the quantity exhausted, and this, after crediting the account with the value of the spent and sold, would have cost not less than £70 per annum, which, in the four years, would have amounted to £280.

But quite an opposite financial result was effected by the adoption of this much-maligned process, none having been bought, but of new and old 326 tons have been sold, and enough remains to last for some seven years to come; and thus by saving an outlay of £280, and by sales of oxide £390, a total gain has been effected of £670 in four years. The total quantity of gas purified in the time was 482 million feet, the purity being considerably in excess of the modern standard.

Disparagement of the process has been over and over again attempted by placing nearly all its proper credit to the use of *air* for revivification *in situ*, and quite recently at Manchester, during a discussion of the subject, one speaker is reported as having said, "But dissociate the air process from the liming and it would soon be found that, taken alone, the liming process would not effect a long continuance of the charge in the purifiers." Now, it so happens that while 1 per cent. is passed into the gas by meter at Tunbridge Wells, *air* is not used with the liming process at Folkestone; and at the latter place, while formerly lime only was used in the purifiers, a change was required every two days in winter, whereas, by the use of the lime process, and oxide only in the purifiers, a change was made once only in five months; and then the change was made solely on account of the induration of the oxide, for not a trace of sulphuretted hydrogen escaped the second vessel of the three in use. Thus we have, by means of the liming process solely, without the aid of *air*, five months' work without a change, against two days on the old system; the quantity of gas purified in the five months being 48,885,800 feet.

In the provinces it is not uncommon for coal gas purification to be effected by oxide only, and in modern times air has been usefully employed for revivifying it *in situ*, thereby prolonging its life and saving labor; but the result in all such cases must be the presence in the gas of an objectionable excess of sulphur compounds.

A notable example of this is afforded in the published report of the Gas Committee of the Corporation of Manchester, for the year ending 31st March, 1887. In this report the Medical Officer of Health says, "The sulphur existing in the gaseous form of bisulphide of carbon was equal to 38.63 grains in 100 feet of gas;" and he further says, "The difficulty of removing this without injury to the illuminating power of the gas, except by the persulphides, has not yet been surmounted, and the latter are very troublesome in their application."

Against this very primitive example, set off that of London. The average of all the gas supplied in the metropolis in the year ending at midsummer, 1887, was found to contain no more than 10.25 grains of sulphur compounds in 100 feet. And at Tunbridge Wells, the quantity for the same period was 10.44 grains, being only 19-hundredths of a grain more than London; the reports resting in both cases upon public authority.

In reference to the objections raised against the character of the coke made from limed coal, it has to be said that a fallacy underlies them all. The assumption on all sides has been that as the sulphur is arrested in the retort it must be in the coke, and consequently be given off on combustion. But the fact is that the arrested sulphur does not rise in sulphurous fumes, as is commonly imagined, and the reason is that the lime acts as an antidote, and causes it to fall, and it is only to be found in the ash; and as gas men become better educated in all that pertains to their calling, they will find that this coke is better adapted for all heating purposes than that made from unlimed coal, and that the evil results spoken of, such as destruction of furnace work, both as regards the brick linings and fire bars, need not be produced, and will not happen under proper management; all that is needed being to regulate the quantity of air passing through the furnaces, so as not to cause excessive combustion.

The Tunbridge Wells Gas Company do not enjoy a monopoly of the sale of coke in the district, supplies being imported from the London, Brighton and other gas works through the usual trade channels; but the Company has derived substantial benefit from the good repute of their coke, made as it all is from limed coal, and in no respect is this felt more than where it is used for horticultural purposes.

One thousand tons per annum have been used at the waterworks of the Local Authority for raising steam, which work was formerly done by coal, ordinary gas coke not having sufficient heating power.

Concerning the chemical action resulting from using lime in the re-

tort, the following is submitted by way of rebutting the statements of those gentlemen who virtually contend that air is the prime factor, and lime is a mere trifle in the account:

1.—Lime, at the ordinary temperature, has a certain well-marked attraction for water; in fact it forms a definite hydrate, thus: $CaO + H_2O = CaH_2O_2$.

2.—*Cold* water will dissolve a certain amount of hydrate of lime, but if this solution be raised to the *boiling point* it becomes milky from the deposition of some hydrate of lime; and further, if this milky solution *is cooled* it again dissolves the hydrate, and becomes clear as at first.

3.—Again, if hydrate of lime (which is a solid that feels quite dry to the touch) is strongly *heated* it gives up its water and becomes lime (*i.e.*, oxide of calcium = CaO).

4.—It thus appears that the attraction of lime (CaO) for water (HO^2) is *governed* by the *temperature;* and as far as these two bodies alone are concerned, the attraction decreases as the temperature increases, disappearing entirely at a bright red heat.

5.—Lime (CaO) and its hydrate (CaH_2O_2) at the *ordinary temperature* of air have a considerable attraction for carbonic acid (CO_2) forming calcium carbonate, thus, $CaO + CO_2 = CaCO_3$; but the working of limekilns make it sufficiently evident that at *high temperatures* this calcium carbonate is split up into lime (CaO) and carbonic acid (CO_2). Here, again, *temperature governs attraction.*

6.—Among the sulphur compounds produced and given off during the distillation of coal there is one known as bisulphide of carbon (CS_2), the arch enemy of the gas maker; now, suppose lime to be present during the operation of carbonizing the coal, then the following reaction is an extremely *probable* one—$CS_2 + 2CaO = 2CaS + CO_2$—calling to mind the *fact* that lime has *no attraction* for CO_2 at a *bright red heat;* all we have to consider is the probable deportment of the calcium and the sulphur toward each other. They must either combine with each other or they must not! As to calcium itself, up to the present time the *only* means of obtaining it in the free state (metallic) are (*a*) by electrolysis, and (*b*) certain fused mixtures, which, among other things, *must contain* a more chemically active metal (as sodium or potassium). Neither of these conditions occur in distilling coal, hence we may safely conclude that the calcium does combine with the sulphur (in the manner indicated) when coal is carbonized in the presence of lime.

7.—The evidence outside the retort being well defined and sufficient, the foregoing considerations simply account for the unseen action inside the retort on well established chemical facts.

8.—Finally, it may be remarked that examples of temperature regulating chemical attraction are numerous; hydrogen and oxygen, for instance, do not combine at the ordinary temperature of air, but they do if the temperature is sufficiently raised. Gunpowder is also another well-known case.

The practical results achieved in the last four years by the coal-liming process are thus shown to be in absolute accord with chemical principles; and it is to be hoped, for the credit of the profession, that persistent opposition to so simple, efficient and profitable a process as this will not be maintained. It is not denied that one effect is an increase of 30 per cent. in the production of ammonia; and it cannot be gainsaid that the nuisance inseparable from the removal of foul lime from purifiers is now perfectly easy to abolish entirely without causing any sensible loss of illuminating power. And as these two primary benefits are, by means of this simple and economic process, readily attainable, without any diminution of that high and desirable degree of purity which cannot otherwise be obtained without costly and complicated methods, it is the dictate of common sense that the system is vastly more entitled to the goodwill of all than the frown of any.

Proper Insulation and Installation.

By Prof. J. P. Barrett.

At the National Convention of Chief Fire Engineers (held last fall, in Atlanta, Ga.) Prof. Barrett presented the following paper:

It was my pleasure to appear before you at the last meeting of this association, and present my views on the dangers arising from electric light wires and the underground system. What I shall offer on the present occasion must, to a certain extent, savor somewhat of repetition, but we must not forget that it is the long continued droppings that wear away the stone. Within the year past there has been permanent as well as rapid advancement in the right direction in the handling of electric light and other wires. This change has resulted, as I believe, from two causes. The insurance people, hand-in-hand with their best friends, the firemen, have made it uncomfortably warm for the electric light people and set them thinking out some cause for this higher temperature, and seeking some method of extinguishing the blaze. Then, too, every twelve months there is a balancing of the books and a rendering of accounts, which has been showing that thousands of dollars have been thrown away by economizing in construction—a good illustration of saving at the spigot and wasting at the bung. The electric light people, like the hotel keepers, are not doing business for their health; and when the capitalist looks over his balance sheet at the end of the year, and finds that he has made no money, it is but natural that he should ask why this is so. The answer is too often found in cheap methods of construction, under a false idea of economy which the company has been induced to adopt. In the earlier days of this business cheap installations were the rule, while to-day, perhaps not the exception, the average is several degrees better. Better or worse construction means less or more danger from electricity; safety is true economy. This much the electric light people will acknowledge to-day, which—at least by action, which sometimes speaks louder than words—a couple of years ago they flatly denied.

In February, 1887, a paper, entitled, "For High Insulation," was read by Mr. C. C. Haskins, before the National Electric Light Association, at Philadelphia, which it was more than half expected would not be well received; yet the result of that paper, which was generously applauded, was to materially advance the cause of protection for both life and property. In that paper reference was made to the underwriter wire which has hitherto been used very largely for all sorts and kinds of outside and inside installations. This wire is probably one of the most mischief-making elements in the business. The insurance people at the outset demanded wire with a fire-proof insulation. That was some years ago. The wire was produced, and consisted of an insulation made of cotton braid, painted with white lead. A covering of that nature was, of course, far from inflammable, and when dry was an insulator. It was accepted, and when the sharp individual who manufactured the article saw the advantage which would arise from a proper christening, he called it "underwriter's wire." The name has sold hundreds of tons, and those tons have cost—heaven only knows how many dollars per pound, in fire losses. I am the more elaborate on this question of painted wire, because in every city that is represented here that abomination is carrying electric currents to-day. You all know what is meant by an insulator or an insulating substance. It is any substance or material which refuses more or less perfectly to carry an electric current, and a conductor is precisely the reverse to this. Then there is a class of substances which, under some circumstances, refuse to carry electric current, while under others they will carry the current as readily almost as the wire itself. One of these substances is cotton—raw, spun or woven. When dry, it is a good sufficient insulator. It is quite difficult to force it to convey electricity; so of nearly all fibers, wool, silk, or hair. Now, if we wet it—merely dampen it—it becomes a conductor. The wetting has done this. The water, in reality, is the conductor, but the cotton string, or cloth, or braid—it is all the same thing—holds the water, and the conductor is there. This so-called underwriter's wire—sometimes called undertaker's wire for variety—is, as I have said, cotton-covered, braided, and soaked with white paint. It is not waterproof, and when dampened will carry electricity of even very low pressure without difficulty. Here is an experiment made by I. N. Miller, of Cincinnati, Ohio. He says: "Careful experiments made by immersing 12 inches of this wire in a 6x8 jar filled with water, the ends extending above the jar so that the water could come in contact with the covering only, shows the following insulating properties:

"After one minute's time the resistance was 11,500 ohms.
"After three minutes' time the resistance was 4,170 ohms.
"After five minutes' time the resistance was 1,770 ohms.
"After one hour the resistance was 280 ohms."

One hundred cells were used in making the test, one pole of the battery being connected with the water in the jar, the other pole with the copper conductor. An ohm is a measure of resistance, of obstruction, the same as a pound may be applied to measure friction resistance. It is something to overcome by current. What Miller was doing was showing how much resistance to the passage of a current of 100 volts—the output of 100 cells of battery—there was in that underwriter's insulation. He reduced it from 11,500 units to 280 units, with one hour's soaking. But this 100 volts of pressure is the equivalent of only two arc lights, for arc lamps require 50 volts of pressure per lamp, as a rule.

Suppose, then, this wire had been tested with, say, a 60-lamp current, or 3,000 volts, instead of 100, what would have been the result? So much for underwriter's wire. I have spoken of it as white wire. Its reputation has so far deteriorated that the manufacturers have put some of it on the market colored black. Look sharp for it, white or black, wher-

ever it comes in contact with moisture it becomes a wolf. For inside purposes, above the level of cellar moisture, where there is neither leak nor steam, the underwriter's wire will do good service on proper insulation, but it will bear watching. The dangers from such electric wires, where these are run in a go-as-you-please sort of way over houses, on poles, fences, pretty much every place where they should not be, as these are quite often placed, cannot be over-estimated or too thoroughly corrected. They are a constant menace to life and property. They are liable at any time to become crossed or grounded on wires, one, if not both ends of which run to ground. The grounded end of the line may be a mile or more away in a dwelling. It may be in a mill that is not running at night, and it may not be anywhere to endanger property. Simply because the fates have bestowed a favorable condition of affairs for years, that is no guarantee for the future. Prevention is always better than cure; it costs less, and leaves the constitution in a better condition.

Right in this line of thought, and in this connection, let me give you a few facts by way of holding this matter down on a solid foundation. Early in the year I took pains to address a circular asking a particular class of information from the authorities in most of our principal cities. I wanted to know direct from those who knew something about the fires and personal dangers of electricity. In several instances no answers were received, and the statistics are, therefore, incomplete.

The tabulated aggregate of what I did receive shows that there have been 137 fires, with a total loss of $1,165,336. Accidents, seven; deaths, forty. Far be it from me to set up my voice against so popular and so necessary an element of industry as the power we derive from the dynamo. It would be foolish, even were I capable of stemming the tide. It has come to stay. It is capable of subjection and training, and this is being done by the inventors and constructors of machines, and those who are making its applications for lighting and for power a study. Its danger lies in the careless handling of a force which, like other great agents of usefulness, may be as potent for evil as for good in bad hands or badly handled. How to curb and bridle this force is what we are endeavoring to find out. We want some reasonable, thorough method of warding off threatening dangers, and at the same time of correcting faults which have existed until they may have become gray-headed.

I am one of those who do not believe that gray hairs are to be honored simply because they are gray. Age is not always to be respected simply because it is here. So I say, let us endeavor to do away with anything gray in this wire business, which has nothing on which to base its claim to respect save its tottering steps and its silvered head. You ask, "How will you do this? How are we to accomplish the result desired, and make our electric light people take such precautions as will insure our lives and the property we have the care of from the dangers which beset us, from their poor installations?" I answer in a word: Insulate them. Place them electrically and mechanically where they can do no harm. How to arrive at that result must depend upon local legislation. Join hands with the insurance interests, appeal to law makers, to your aldermen, your councilmen, your selectmen, your commissioners—whatever the law-making body may be. You will find plenty of encouragement from the property owners, who depend on you in cold weather emergencies—men who have property to lose; these will aid you in obtaining the proper law to restrain the lawless methods heretofore practiced. It is quite the fashion everywhere to do this, and you will not find yourselves out of style. What you demand in your ordinance or regulation should be well considered and digested before presentation. There is nothing like having such an act far-reaching and thorough, and it is not at all comforting to feel, after an act has passed, that an essential point has been omitted. There are more towns and cities in the Union which will adopt, as Chicago and some other cities have already adopted, a general underground system, and compel all wires to go into this. Some are now in the agony of that sort of birth, some are not yet up to the scratch, but a good many will get there in the end. There will be a majority of these towns which will own and control the underground system they adopt, and I think they will do well. We hear everyday from somebody, away off down in some swamp or back alley, shouting at the top of his voice, "Underground is a failure." It is too late in the day to discuss that question. It is working in Chicago, and in our own conduits we have as many varieties of wires as there are above ground in any two cities in the Union—as many *kinds*, understand. We have everything from a cable less than an inch in diameter, with 50 wires in it, up to a cable as big as your thumb, and only one wire in it; we have telegraph and fire alarm, and telephone and call bells, watch service, mercurial and burglar alarms, and police, and—well, if you can think of anything else, call the turn. We have it in our conduits, and they all work, and work far more satisfactorily than the overhead undertakers' lines. Don't let the croakers rule you off the track. I would say, then, put them underground, if that can be accomplished, and pull down every wire which is overhead. Many of you can accomplish that desirable end.

As a second choice, I would say put them under control of an electrician, if possible, who will, under proper authority from the heads of the government, kindly but earnestly enforce such changes in bad installations, and compel such methods in new ones, as will render the work reasonably safe. The parties who do this inferior sort of work are not wholly to blame for what seems to be willful or careless. They do not know. Take an example which recently fell under my notice near Chicago. An outdoor installation was being constructed where a part of the wires were run on the joists underneath an uncovered platform. The wire was of the description above alluded to—underwriters'. The floor was dry, the joists ditto, and the wire was run without insulators. Before the work was fairly finished a heavy shower came up, and the whole plant was so thoroughly wetted that it had to be done pretty much all over before it was fit to run. Now, if the constructor had been permitted to finish and get out of the way before that shower came, he would always have thought he had done an excellent piece of work. As it was, he said he had no idea of rain getting under the planks, although they were hardly close enough together to play marbles on.

If, in the third place, it is neither possible to control the wires by burying nor inspection, there remains but one course to be pursued, which is to have such restrictions thrown about the placing of plants as shall compel—

1. A class of wire to be used which is not affected by water.
2. Lines to be placed upon insulators everywhere in passing along buildings, and run clear of rods, awnings, etc.
3. If on poles, lines to be sufficiently high to prove no obstruction.
4. In crossing buildings, to be at least 7 feet above the roof.
5. Lamps in front of a building, over the sidewalk, to be fixed and trimmed from a step-ladder, or placed upon some form of crane which takes the strain from the suspension rope.
6. No joint to be made in the wire where it can reasonably well be avoided; all joints to be soldered and taped with insulating tape.
7. At all points where abrasion is possible, or where wires pass through partitions or into buildings, particular care to be taken to preserve the insulation intact. And even then there should be some method of testing the lines for insulation, though that is in the line of an inspector's duty, and some instruction is necessary to accomplish this.

In the matter of incandescent or glow lamps, there is less of danger to person, but there are forms of this system which are attached to and made part of arc circuits, which actually make this worse than a simple arc line, because the majority of such combinations are liable to do some unexpected thing, and it is always the unexpected that happens. An incandescent circuit, pure and simple, owes its safety largely to the introduction of fusible strips at the various branchings of the wire, and there should never, where possible to avoid it, be more than six of these lights to one of these safety devices.

We are constantly reminded by the curious and apparently lawless action of electrical force that it is the possibilities and not the probabilities of the case which we must guard against and prevent. No two consecutive cases are precisely alike, and no law can possibly stipulate all the points to be watched in every possible case. Some judgment, some discretion, must be left to the inspector, the examiner, or expert, and he should be able to explain clearly and fully why he demands this or that in one case which he has not required in another; and when he has made the demand, or given the order, there should be no lack of authority at his back, and no interference with him on account of friendship or favoritism. If the man is capable, stand by him; if he is not, let him go, and find one who is.

I have briefly outlined a few thoughts on this subject, which will bear elaboration far beyond the time you would place at my disposal. I shall be happy to give any who desire it any information which practice and experience may have placed at my disposal, and trust that I may possibly have dropped a hint or two to aid in the good work of protection from danger, while encouraging the proper advance of electricity as an illuminant and power.

MAYOR HAYNES has caused much woe amongst the ranks of the projectors of the Newark (N. J.) Underground Lighting Company, the Common Council having granted the latter corporation a license to occupy the streets and highways of the city. The Mayor buried the "undergrounders" by vetoing the aldermanic consent. His message on the subject is an admirable document, although some of the aldermen may not concede that fact.

Brock's Chain Wrench.

Letters patent (No. 375,119) have been granted to Wm. H. Brock, of Brooklyn, N. Y., for an improvement in the manufacture of chain wrenches. The inventor's claims comprise :

1. A pipe wrench comprising the head and handle, the clamp E, formed in separated sections movable toward and from each other, and the gripping connection, substantially as set forth.

2. The combination of the wrench head provided with a shoulder, f^4, and having a socket to receive the lug of the shoe, and a brace, H, the shoe abutted at one end against said shoulder f^4 and provided midway between its sides with a lug fitted to the socket of the head, and the gripping connection, substantially as and for the purposes specified.

3. The combination of the head and handle, the clamp formed in separated sections and extended through an opening in the wrench head, the shoe, the chain connected with the lower end of the clamp, and the bar connected at one end with the chain and movable into and out of engagement with the upper ends of the clamp sections, substantially as set forth.

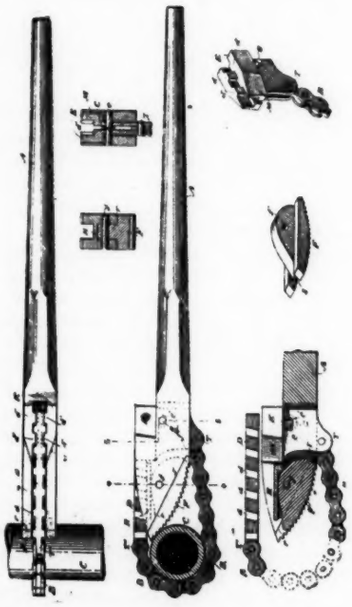
4. The combination, in a wrench, of the head, the clamp formed in separated sections, a spring for forcing such sections apart, the chain, and the bar connected therewith, all arranged and operating substantially as set forth.

5. In a wrench, the combination, with the head having a shoe and provided with inclined bearings, of the chain and bar and the clamp formed in separated sections, the forward ends of which are inclined correspondingly with and movable into engagement with the inclined bearings of the wrench head, substantially as and for the purposes specified.

6. In a wrench, the combination of the head having bearings M, inclined or beveled longitudinally and transversely, the clamp sections having their forward ends also beveled longitudinally and transversely, and the chain and the bar, substantially as set forth.

7. The combination of the wrench head having inclined or beveled bearings M, the clamp formed in separated sections movable at their forward ends into engagement with the bearings M, such sections being also movable toward and from each other, and the gripping connection, substantially as set forth.

8. The combination, in a wrench, with the head and chain, of the clamp formed in separated sections which are movable toward and from

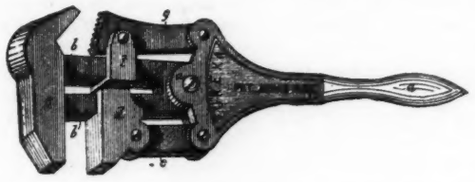


each other, and the bar D, said bar and clamp being provided with interlocking projections d d', arranged obliquely, substantially as and for the purposes set forth.

9. The improved wrench herein described, consisting of the handle and head having an opening for the passage of the clamp and provided with a shoe, the clamp formed in separated sections having projections d' and extended through the opening of the head, a spring for forcing such sections apart, the chain connected with the lower end of such sections, and the bar D, connected with the chain and having projections d, substantially as and for the purposes specified.

The Hale Self-Adjusting Combined Wrench.

Chas. W. Hale, of Eureka, Kansas, has patented a wrench, the chief novelty of which consists in the adaptability of the jaws thereof to adjust themselves to grip any size of nut or pipe within their range by a swinging motion of the lever handle, a, as in opening a common wrench.



The inventor claims that the grip of this wrench is more perfect than any screw-adjusting wrench, because it is controlled entirely by the handle. It will be readily understood that the harder a nut is to turn the tighter the jaws will grip it—therefore it cannot slip.

The *Engineer* says that these wrenches are especially adapted to the use of machinists, engineers, pipe-fitters, etc., and are suited to almost all classes of work for which wrenches are used.

Preventing the Formation of Scale in Boilers by the Use of Kerosene.

By F. L. Lyne, M.E.

[The following is an abstract of a paper read by the author at the XVI. Annual Meeting of the American Society of Mechanical Engineers.]

The action of kerosene oil for the prevention of scale in steam boilers is a subject upon which the books appear to be silent. At least the writer has been unable to find any practical data that could be made use of in determining its value as a scale destroyer. It has often been recommended, but its application for that purpose, so far, has been quite limited. Many theories in regard to its action inside o steam boilers have been indulged in by engineers, but no systematic course of treatment has yet been brought to my notice. Therefore a portion of practical experience is presented herewith in that line, with the hope that others may be induced to compare notes, and all parties concerned receive substantial benefit. In consultation with an engineer, for whom I entertain a very high regard, he suggested that I try crude petroleum as it was better than kerosene, but he gave no plausible reason why, nor advice as to the quantity or method of introducing it. There was but one course left for me to pursue, which was to try some experiments.

At the Jersey City Electric Light Company's station we have two sectional boilers of the new Root type, 100-horse power each, and one of 155-horse power. We use the Passaic water, which makes a great deal of scale, and in the steam space I have noticed a very marked corrosive action, more especially upon the cast iron flanges of the safety-valves. Within the shell boilers, which we formerly used, hard scale was formed to an alarming extent, and we could not get a scraper between the tubes to remove all of it. In the dry season salt water found its way into the reservoir, and I now have large lumps of saline matter which were removed from our boilers.

In the boilers which we are now using hard scale would form so as to more than half fill some of the 4-inch tubes of which our boilers are principally composed. Something had to be done. I had tried several compounds, with more or less degrees of success, but still the interior of our boilers could not be kept clean. We tried blowing off, used scrapers and other devices, but without obtaining permanent relief. The deposit was mostly in the lower row of tubes, and within four feet of the back ends near the mud-drum. The loss of heat due to this incrustation was great.

Nystrom gives the following for calculating this loss :

$$H=\frac{t^2}{32\times t^2}$$

in which t equals the thickness of scale in sixteenths of an inch, and H the per cent. From this it would seem that a scale of one-sixteenth would cause a loss of about 15 per cent.; three-sixteenths, 23 per cent., and so on. Some have claimed the conductivity of scale to be at least 30 per cent.. less than iron, hence we recognize the necessity of keeping boilers free from scale and sediment.

As a preliminary experiment with kerosene oil, I took a test tube of 1-inch diameter, and in it placed a lump of scale taken from our boilers. A tablespoonful of water was then added, with a film of kerosene upon its surface. Heat was then applied from a Bunsen burner. When ebul-

lition began the kerosene separated into globules and followed the sides of the tube to the bottom, thence they arose through the center to the surface. This action continued as long as heat was applied, and proved conclusively, to my mind, that the kerosene would not remain upon the surface of water in a boiler, as has been argued by some engineers. I have since proved this correct, beyond a doubt, by drawing water impregnated with kerosene from near the bottom of the boiler. From the time the water in the test tube began to simmer the scale commenced to disintegrate, and continued until nothing was left but the hardest substances.

I concluded from this experiment that kerosene oil was just the thing to use in our boilers, so an apparatus to introduce it was made and attached to the feed-pipe. It is an inexpensive affair, made of a piece of 5-inch iron pipe, 12 inches long, with a cap screwed upon each end as shown. A pipe at the bottom connected with the hydrant, while the pipe at the top conveyed the kerosene into the feed-pipe when the water was turned on. A tallow cock was screwed into the top for filling while the air and water were drawn off at the stop-cocks shown for that purpose. When the feed-water is taken from a tank or well where there is no pressure to force it into the boiler, a globe-valve must be placed in the feed-pipe, so as to compel the water to flow temporarily through the reservoir, in the direction shown by the arrows, carrying the oil along with it. Our feed-pipes used to clog up with hard lumps of scale and rust from the water, but since we began using kerosene these pipes are all clean and they do not rust. I therefore recommend that the reservoir be placed so that the kerosene may pass through all the water pipes if possible. When our apparatus was ready for use the water was blown off from a 100-horse power boiler, the blow-cock closed, and two quarts of kerosene oil introduced. The injector was then started (by steam from one of the other boilers), and as the water rose the kerosene reached every part of the interior surface. Before filling this boiler an examination was made which showed scale in the tubes of three-sixteenths to one-quarter inch in thickness, while in the headers it was half an inch thick in places. We never put cold water in our boilers, either to wash or fill them, unless they are cold, for I have known cracks to originate in steel boilers by so doing. We put in two quarts of kerosene every other day for one month, when this boiler was blown off at 10 pounds pressure. It was then opened and examined, when we found that the scale was partly dissolved and loosened so that a scraper removed most of it from the inside of the tubes. The scale in the headers remained quite hard, although the surface was softened by the action of the kerosene. The blow-off cock was then closed, and two quarts of kerosene put in, after which the boiler was filled with water as described. The object of putting in the kerosene first is to have it penetrate the scale and loosen it as the water rises, and we know that it does this. During this second month we used the same quantity of kerosene, and in the same way as the first month. At the expiration of that time the water was blown off, and an examination revealed the tubes perfectly clean. There was, however, some scale left in the headers, but it was so soft that it could be easily removed with the finger nails. We used no scraper this time, but just closed it up, put in two quarts of kerosene, and filled it as at first. During the third month we blew down two gauges of water every week, and used the same quantity of kerosene as before. At the expiration of the third month we blew off the water and opened the boiler, when, to our satisfaction, we found it *clean*, a condition that never before existed since we started the boilers. The dirt had all settled in the mud-drum, and when the blow-off cock was opened it passed into the sewer. Not a teaspoonful of sediment was found inside this boiler. I closed this boiler and ran it three consecutive months without opening the blow-off cock or changing the water during that time, using the same quantity of oil as before. At the end of the three months the water was blown off, and no dirt was found in the tubes, and very little soft mud in the mud-drum. This, I thought, was a very conclusive experiment. We then adopted a rule of one quart of kerosene per day for each of the 100-horse power boilers, and three pints for the 155-horse power boiler. The water is blown down two gauges every week, and the entire contents every month. Water is never used to wash them out nor is a scraper necessary, for the mud all goes out with the water. An examination is made of the interior, and we put them to work again. This is a wonderful relief to us, for the reason that no scale forms in any of our boilers, and the corrosive action mentioned as having existed at first has entirely ceased.

Another thing worthy of special notice is that it was impossible to keep a glass water tube in use more than three months at a time, and oftentimes they would break within two months. Before using kerosene these tubes would become badly grooved and eaten away at the upper ends, so that they would break. Our engineer came very near losing his eyesight through the breaking of one of these glasses, and his face was badly disfigured by being cut with the broken glass. Now these tubes do not show any such action, and they have been in use more than a year.

I admit that rubber packing and kerosene oil do not agree, so to guard against any trouble from that source I had new nuts, 1½ inches deep, placed at the ends of the glass tubes, and used asbestos wicking dipped in boiled oil, and then squeezed dry, for packing. They do not leak, and these joints are permanent.

I never use rubber packing in flange joints about a boiler, or in any place where it comes in contact with steam. For faced joints I insert asbestos in sheets, one-sixteenth of an inch in thickness; and for rough joints the same material one-eighth inch thick. After purchasing the asbestos I spread upon both sides, with a brush, all the boiled oil that it will readily absorb, and then hang up the sheets until required for use. When a gasket is needed, we cut it to the required size, then rub both sides well with pure graphite, and screw it up hot, after which no more attention is required. We have joints made in this way which have been in use more than three years, and as yet have shown no sign of leaking. I took some of them apart recently, and the surfaces separated very nicely, and there was no evidence of rusting or corrosive action upon them. A short time since one of our neighbors had a great difficulty in making a joint upon a badly rusted mud drum of a shell boiler, and it could not be kept tight for any considerable length of time. He made a gasket of asbestos prepared as described, and has not touched it since.

In taking apart our flanged joints we broke no bolts nor split any nut, as is usual with such joints made in the ordinary way; for when these joints were made we smeared the threads and nuts with graphite mixed with boiled oil. A small quantity of this substance rubbed upon the stems of safety valves will prevent them from sticking or corroding. A small monkey-wrench easily removed the nuts, and none of them were rusted. This is the way we treat all of the nuts and bolts upon our boilers, and the same mixture is used in putting up steam pipes. The result is that we break no fittings, nor do we split any pipes in taking them down after years of service. I am aware of instances where graphite used upon iron surfaces has shown, when taken apart, a sort of hard scale, having the appearance of some sort of cement. This is liable to occur when the graphite contains foreign substances, such as silica and sulphur. The common, cheaper forms of graphite will not give satisfaction for these purposes; it must be pure. The kind that I use, and have used for the past 15 years, is made by the Dixon Crucible Company, who have a special process by which they remove all earthy and mineral substances, leaving the flakes of graphite pure. I have never had any unpleasant experiences with this grade of graphite, and have used it extensively, not only as described above, but also in the cylinders of steam engines.

In conclusion, I desire to say that crude petroleum has, to my certain knowedge, been used in steam boilers during the past 11 years and upward, where, with judicious application, it has been successful in removing and preventing scale. While this is admitted, I must also acknowledge that great damage to boilers has resulted by not observing the necessary precautions in the quantity put into the boiler each time. I will mention but one instance, which is that of a tugboat now running in New York Harbor. The boiler was badly scaled, and someone advised the engineer to use crude petroleum; so he "gave the boiler a good dose," as he said. In a few days the tubes began to leak, and the crown-sheet bagged down. The boat was then laid up, when it was found that the heavy oil had mixed with the mud, and had formed a paste on the crown-sheet. This paste kept the water from reaching the plates, hence the result stated above. This paste was so dense that water from a hose would not dislodge it; and I do not hesitate to say that, had kerosene oil been used in this instance instead of crude petroleum, the boiler would not have been injured. The reason is that there is not sufficient body in kerosene oil to form a paste. The chief objection to crude petroleum is that it is too heavy, while in kerosene oil there is no substance which will stick fast to the interior of a boiler.

In it we find all that is necessary to accomplish the desired object without the objectionable features just mentioned. I appreciate the fact that there may be instances where steam is blown directly into fibrous materials in the course of their manufacture, and also in the preparation of articles of food, where the odor or possibly the taste of kerosene oil might be disagreeable; but such instances are few when compared with the many where it might be successfully employed for the prevention of scale in steam engines. Some engineers advance very queer theories against the use of kerosene; but I must assert that, for the most part, they are only imaginary. We have as yet found no objections in our experience. Our boilers do not lift their water, they are free from scale, and our fuel bill is thereby greatly reduced.

Making Pig Iron With Gas.

The *American Manufacturer* says that Mr. Jacob T. Wainright, a well-known metallurgical engineer of Pittsburgh, Pa., has succeeded in making pig iron with natural gas as fuel. His furnace differs from the ordinary blast furnace in this, that while dispensing with coke, it has overcome the great difficulty noted in connection with other experiments in gas furnaces by a mechanical device for supporting the burden. This device consists of a series of pipes, covered with fireclay tiles, and at the same time ventilating the pipes with a current of air. A combustion chamber is also connected with the furnace, which reduces the amount of gas needed to produce the required heat, and also prevents the chilling of the furnace, which has been a great obstacle to the success of other experiments.

In the new furnace the ordinary cupola blower is used, and the gas and air are introduced in a very simple manner into the combustion chamber in a separate pipe. The current for cooling the tubes, already mentioned, is supplied from the same air blast, and from thence may be utilized in the furnace. Ordinary cupolas may be easily altered so as to do the required work by adding the combustion chamber and the protected tubes for supporting the burden.

The tests were made at the iron and lead works of Wm. G. Price, on Price street, where the inventor had the hearty co-operation of the manager, Mr. David Carlin. Mr. Carlin says that the furnace worked rapidly, and that its success is no longer an experiment.

Fire Test for Kerosene.

According to a contemporary, it is strange to note how few people know what is meant by kerosene oil of 100°, or 120°, or 150° fire test. It simply means at what degree of heat that particular quality of oil would produce a combustible and dangerous gas. The flame of a lamp always creates a certain amount of heat which, through induction, is communicated to the oil; therefore if the oil is of a low grade, say, 90°, when the oil reaches that point it will emit gas which will ascend, and is liable to take fire from the flame and will explode the lamp. It is a very simple matter to test the quality of oil in the following manner.

Take an ordinary pint tin cup and fill it within an inch of the top with water warmed to the temperature of 120° F., which can be ascertained by the aid of an ordinary thermometer. Pour on this water three or four tablespoonfuls of the oil to be tested. Stir the oil and water together, and wait a short time, say, a minute or two, for the oil to collect on the top. Try the thermometer again, and if the temperature is more than 1° from 120° F. add a little cold or hot water, as the case may be, so as to bring the temperature to within 1° of 120° F. Then stir again and give time, as before, for the oil to come to the top. Now apply a burning match or lighted taper on a level with the top of the cup, say, within half an inch of the oil. If within one second no flash occurs, the oil is reasonably safe; otherwise it is unsafe.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Texarkana Gas Light Company, mention of the likely incorporation of which was recently made in our columns, is now an accomplished fact. The proprietors propose to push the work of plant construction to speedy completion; and they have good reason to congratulate themselves over the terms of the franchise secured. They are given exclusive right to make and vend gas in the locality for a period of 30 years, the authorities binding themselves to maintain at least 60 public lamps. About 200 residents of all classes have agreed to become customers of the Company. One peculiarity of the location lies in the fact that Texarkana is situated in two States—Texas and Arkansas—but we presume the Arkansas end of the settlement is the more important, because it is returned as the capital seat of Miller county, in the last-named State. A well-known Western engineer has been retained to act as Consulting Engineer for the Company.

CHEAPER GAS FOR LA FAYETTE, IND.—The Directors of the La Fayette Gas Light Company have authorized Supt. Wm. Wallace to institute a new schedule of selling rates, the same to apply to all gas furnished from the 1st inst. The net figures under the schedule are appended:

Monthly Consumption Quantities.	Net Rate per M.
Under 1,000 cubic feet	$1.70
From 1,000 to 5,000 cubic feet	1.60
From 5,000 to 10,000 cubic feet	1.50
Over 10,000 cubic feet	1.40

The only condition necessary to secure the benefit of the schedule is that payment of accounts must be made within 15 days of date of presentation. Pennsylvania coal is used in the La Fayette works, and when it is known that the taxes paid by the Company on account of the city and county levies amount to 12½ cents per thousand cubic feet of gas sold, it must at once be conceded that the stated figures are very low indeed. The proprietors say that in making the present great concession they rely for reimbursement on a largely increased demand from consumers. Such demand can be readily met—it is also certain that it will be made—by the Company, for its present plant is of sufficient magnitude to cope with a send-out far in excess of that so far reached. Another item going to prove the cheapness of La Fayette's current gas rate is found in the statement that the Company operates 22 miles of mains, while the population of the city cannot exceed 25,000 persons. The progress of this city, so charmingly situated on the most historic and pleasing spot obtainable on all the long stretches of the winding Wabash river, certainly suffers no restraint at the hands of those who minister to her artificial lighting needs. The notice to the consumers also contains another bit of information that will be of interest to the fraternity. The proprietors say: "This Company purchased the right to use one of the best fuel and water gas plants now known, but after a thorough investigation it was thought best not to put in the machinery on account of the large proportion of carbonic oxide contained in water gas." So the La Fayette gas men evidently adhere to the Greenough style of reasoning (which is in accord with our own), as expressed by that gentleman in his annual address to the New England Association, at the Providence session, in 1886. Those who care to discover why we think the La Fayette and Boston ideas in regard to the sale of carbonic oxide are identical can find the proof by inspecting page 124 of the issue of the JOURNAL dated March 2, 1886. However, be those ideas well or falsely grounded—and such decision will be arrived at in varying instances by marked divergence of verdict—there at least must be unanimity of opinion that La Fayette is now enjoying very cheap gas.

Mr. and Mrs. Irvin Butterworth, of Columbus, Ohio, received a valuable and weighty present, in the shape of a bouncing son and heir, on the last day of the old year. "May he live long and prosper."

THE Clevelaud (Tenn.) authorities have closed a contract for street lighting with the recently organized local electric light company, which will at once commence to equip a plant. The town takes 10 high-power arcs, at the rate of $60 each per annum, on a moon-table. Private parties have agreed to maintain 100 arcs.

AGAIN DESTROYED.—Despatches from Sioux Falls, Dak. Ter., dated Jan. 2, bring the news that the local Gas Company's plant, which was partially destroyed by an explosion last October, but which had been rebuilt and enlarged, passed through a similar experience on the 2d inst. It seems that a generator in the new portion of the works exploded, totally demolishing the new plant, and a portion of the old as well. Nobody was injured. The loss is not less than $10,000.

PAWTUCKET (R. I.) appropriated $23,904 to pay for her street lighting during the fiscal year, ended Nov. 30, 1887. Of that amount $23,895.35 was expended, the slim balance of $5.65 bearing witness to the fact that the "committee kept scrupulously within the limit of the appropriation." In 1886 Pawtucket had 96 public arcs in service; in '87 the total was increased to 151. The contract price was $150 per lamp per annum. Mayor Sales, in his "retiring address" to the City Council, thus alludes to the question of public electric lighting in Pawtucket: "At almost every meeting of the City Council petitions have been presented for electric lights in localities not already furnished with them, or, if partially supplied with them, asking for still more. How far the city can and will go in this direction is an important question, the answer to which will largely depend upon the terms which can be made with the electric light companies. I am still of the opinion expressed by me in my message of one year ago, that if the electric system is to be permanently adopted, the city should control its lighting department the same as it does its water works."

LANDLORDS AND THEIR OBLIGATIONS IN THE MATTER OF LIGHTING BUILDINGS.—Julia S. Halpin some time ago brought suit for damages against Thomas C. Townsend, who is the owner of the premises No. 151 Fourth Avenue, this city. It appears that plaintiff sustained injuries to her person, because of having fallen down a flight of stairs in the Townsend building, on an evening when the gas bracket burner at the head of the staircase was unlighted; hence the suit, which was predicated on the theory that the landlord was liable for negligence. The case was originally tried before a jury who found for plaintiff, but the General

Term set aside the verdict, which course has since been sustained by the Court of Appeals. The argument before the Court of last resort is well worth reading. The decision establishes the fact that in this State a landlord is not liable for injuries received by anyone through his failure to illuminate staircase landings by artificial means. Of course, the decision must be accepted; nevertheless we are inclined to the view that in this case good law looks like poor logic.

It is a wonder that the plant of the West Chester (Pa.) Electric Light Company remained intact for the length of time granted it—that is, if a local paper's suggestions thereon are to be accepted as true. At any rate the *News* of that section is on record as saying: "It looks to us that the West Chester Electric Light Company was run on the 'Cheap John' plan. If it is true that it discharged a competent engineer, at a salary of $12 a week, in order to employ one who would work for $9 a week, there is a terrible responsibility resting upon it." In either event the employment of an engineer to run a battery of three boilers at the salaries named would seem to indicate that the plant was run on the "murderous plan!" Street sweepers are not engineers.

Public Lighting, Mt. Vernon, N. Y.—The authorities of Mt. Vernon have awarded contracts for street lighting, the work to be carried out on the mixed plan. The local electricians are to furnish 30 arc lights, at a charge of $100 each per annum, while the East Chester Gas Company will maintain 150 gas lamps, to be paid therefor at the rate of $20 per annum each. The electric portion of the contract is to remain in force for one year, but the Gas Company has been authorized to carry on the service, at the terms stated, for three years. This ends a rather long drawn out argument and a protracted series of investigations concerning the most available method for lighting Mount Vernon, and the outcome seems to show that the hand of Mr. Nettleton, Sr., has far from lost its cunning.

While on the subject of Mt. Vernon gas matters, and to show that Mr. Nettleton's business craft is as well poised as ever, we note that the East Chester Company will, on the first calendar day of the coming spring, institute a net rate of $1.80 per thousand cubic feet. This will be a reduction of 10 per cent. from the present schedule, and all classes of consumers are to share therein.

Brother Lynn smiles serenely over the state of affairs now existing in the vicinity of the plant of the Chattanooga (Tenn.) Gas Light Company. An expenditure of about $50,000 has placed the works in magnificent shape, and the $1.60-rate seems to equally please the gas consumers and the gas shareholders. How could it well be otherwise?

Organization Meeting, Binghamton, N. Y.—The Directors of the Binghamton Gas and Brush-Swan Electric Light Company held a meeting for organization, on Dec. 29, at the Susquehanna Valley Bank. They selected the following officers: President, Jas. W. Manier; Vice-President, Geo. F. O'Neil; Secretary, Jno. Anderson; Treasurer and General Manager, Wm. G. Phelps. The new offices of the Company are in the Phelps' bank building.

The Morristown (Pa.) Water Company proposes to try the experiment of utilizing its pumping plant during certain hours for the purpose of furnishing incandescent electricity, provided the residents agree to take a sufficient number of lights to insure the Company from loss. Perhaps the proprietors under the proposed sales schedule ($1 per week for 8 lights) see their way clear to making themselves whole on the transaction; but were we in their position our faith would hardly be equal to the occasion.

Omaha (Neb.) Gas News.—The Omaha *Bee*, in strange conflict with much that has appeared at other times in its columns, when dealing with the same topic, now speaks about the Omaha Gas Manufacturing Company after the following fashion: "This progressive institution has always kept pace with the city's improvements, and during the past year it has done even more than this by anticipating future growth to a certain degree. The Company has $800,000 invested in the Omaha plant. Its officers are: President, Frank Murphy; Secretary, Geo. E. Barker; Treasurer and Superintendent, Isaac Battin. The works cover three-quarters of a block, at 11th, Jones, and Leavenworth streets. The up-town office is now located at 220 South 13th street, but before March 1 new offices in the Merchants' Bank are to be occupied. The plant improvements made during the past year have been numerous and costly. The machinery has been remodeled and the generating house rendered fireproof. New apparatus has been purchased, and the quality of the gas has been greatly improved. A new two-story brick building (34 by 70 feet) was erected during the year, in which are located the meter repair, service, machine, and blacksmith shops, storage rooms for supplies and tools in connection with the street main and street lamp departments, and comfortable stables, etc. The total cost of all this was $93,000. During '87 the Company laid about 24 miles of street mains, ranging from 4 to 12 inches in diameter. 800 services (300 of these being blind) were run. The mains extend somewhat beyond the line of present needs, but many more miles will have to be added in the current year. The main and service additions represent an expenditure of $100,000. There are now in the city 675 street lamps, 173 of which were erected in '87. Each lamp cost $22 to erect, and this item represents an expenditure of $3,806. The list of consumers of the Company has increased over 30 per cent. during the year. New meters to the number of 600 were placed, the total of these now in duty numbering 2,450. During the year a quantity equal to 120,000,000 cu. ft. of gas was consumed, showing an increase of 25 per cent. over 1886. The average number of employees during '87 was 102, and the pay-roll averaged about $5,000 per month." The *Bee* man manages to make out a pretty good case for the local gas men.

Annual Meeting, Pacific Gas Improvement Company.—At a meeting of the Pacific Gas Improvement Association (San Francisco, Cal.) the stockholders elected the following Directors: Geo. W. Beaver, H. L. Dodge, Albert Miller, Lloyd Tevis, and Robt. Watt. The Board organized by naming the following officers: President, Albert Miller; Vice-President, Geo. W. Beaver; Secretary, I. M. Livingston; Treasurer, C. O. G. Miller. The choices were made without dissenting votes, and 28,212 shares were represented out of a total of 30,000. The Company had quite a prosperous year.

Prof. Wm. G. Mixter, of the Sheffield Scientific School, is the official gas inspector for New Haven, Conn. The law under which he holds office provides that any gas consumer may have his meter officially tested, without cost to him if the instrument is found to be defective. In case the meter is correct, the expense of such determination is to be borne by the consumer, but in no case is that expense to exceed the sum of $1.50. The law also declares that gas shall be tested monthly, if such request be made by the Mayor or Selectmen; also, that "when any gas so furnished shall be found upon such inspection to be below the standard value on the average for the quarter, the person furnishing it shall make a deduction in favor of the consumer from the price charged for gas of a legal standard proportioned to the inferiority of the gas as reported by the inspector." We do not know how these latter provisions will appeal to the general reader of them, but we incline to the view, under the statutes made and provided for the government of such matters in New Haven, that New Haven's gas inspector seems to be clothed with powers which border closely on those reserved for an autocrat.

From the report of the local committee in charge of public lighting matters in Portland, Maine, we learn that during the month of December the total number of hours in which one or more of the arc lights failed to shine footed up at 509½; the incandescent delinquencies for the same period being reported at 440 hours.

The proprietors of the Easton (Md.) Gas Light Company propose to raise the selling price to $2 per thousand cubic feet, the present schedule calling for a payment of only $1.25. This price was instituted some months ago, at a time when a local electric lighting company was in the field for public favor. The Easton Company's annual output does not exceed 1½ millions cubic feet.

In connection with the new works at Texarkana, Ark., we should have added that W. L. Whitaker asks for proposals for construction from gas works builders. About 5 miles of mains are included in the specifications.

The Iowa Supreme Court has decided that the authorities of Oskaloosa have the right to enter into a contract with the Edison Electric Light Company for lighting the streets. The bench held that the plaintiff (the Oskaloosa Gas Light Company) had failed to show *with certainty* what injury it would sustain in case the city decided to employ electric lights. Nevertheless the Oskaloosa Gas Company was granted, and is working under, an exclusive contract agreement supposed to be of the most stringent nature. The Company has lived faithfully up to the pledge of its charter, but that makes no apparent difference to the party of the first part. 'Tis "heads I win; tails you lose," with the Iowa bench—as is the case with many other benches, too. West Virginia, for instance.

ORANGEVILLE, CANADA, WANTS ELECTRICITY.—A. A. Hughson, Town Clerk, sends the following: "The town of Orangeville will receive sealed tenders, up to Feb. 1st., for lighting the streets. The town will take 15 lights, and it is probable that private parties will take 30 more. The lowest or any tender not necessarily accepted." Communications should be addressed to Mr. Hughson.

DEATH OF MR. DAVID DONALDSON.—At a special meeting of the Directors of the Citizens Gas Light Company (Buffalo, N. Y.) the following memorial was adopted, every line of which, by-the-way, is founded in truth: "In the death of Mr. David Donaldson, who, after a brief illness, passed away from life on November 26, 1887, we have great cause for sorrow and regret. *Whereas*, For many years Mr. Donaldson was one of the most active and energetic directors of this Company. He was a man of genial nature, strict integrity, liberal views and true friendship; therefore be it *Resolved*, That in the death of Mr. Donaldson we have lost an associate who was a valued friend, an ardent supporter and a wise counselor at our meetings, who always held the interest of the Citizens Gas Company as director as an honorable trust, a good citizen and a worthy member of our board, filling the position with honor and credit to himself. *Resolved*, That we deeply mourn his demise, and will ever cherish his memory. *Resolved*, That these expressions of our high regard and esteem be spread upon the minutes, and a copy be forwarded by the Secretary to the family of the deceased."

TO-MORROW Miss Louise Clement White, the charming daughter of Col. and Mrs. Clement A. White, will be united in marriage to Mr. C. S. Tarbox. After the ceremony a reception will be held at the residence of the bride's grandfather, Mr. Thos. McKellar, Penn and Hancock streets, Germantown, Pa. The reception will be from 7 until 9 o'clock. "O happy pair, O happy fair, O happy, happy swain!"

THE annual meeting of the St. Louis (Mo.) Thomson-Houston Electric Company was held on the 3d inst. The following Directors were elected: J. N. Boffinger, C. C. Carroll, D. R. Powell, N. Crane, and P. P. Mannion. The resignation of Supt. Atwood was accepted. President Powell is said to have ridiculed the idea that anything of moment would result from the proposed entrance of the Laclede Gas Light Company into the field of electric lighting supply in St. Louis. Still, we are inclined to the view that the proprietors of the named Gas Company do not take steps in any direction without first having gained a pretty good idea about the sort of country through which the particular road is about to introduce them. No blind thoroughfares for the Laclede folks.

PEOPLE living in the vicinity of A and Howard streets (Virginia City, Nev.) experienced much unpleasantness and not a little discomfort from the odor of illuminating gas which penetrated their dwellings, although not one of the complainants was a customer of the Gas Company. After a weary time spent in investigation, Supt. Osborne discovered and remedied the cause of the complaint. Virginia City, as almost everyone knows, is on the site of what is probably the greatest known deposit of precious metals (gold-bearing silver ores) in the world, and although the point at A and Howard streets is far removed from the section that for years has been honeycombed by the picks and drills of the miners, nevertheless their operations have been on a scale of such magnitude that the underlying portion of the city still on solid foundation is slowly but steadily pressing on to fill in the gap that has been created in the Comstock lode. This pressure causes many breaks in Virginia City's underground conduits, and accounts for the A street experience above noted, where the investigators found that the gas was escaping from a point where a ½-inch service pipe (long out of duty) had been pulled out of the street main.

ON New Year's eve a disastrous explosion occurred in the exhauster house of the Equitable Gas Light Company, this city. Much damage was done, and Supt. Plaisted lost his life. An attempt has been made to account for the affair on a theory to which all explosions not patent on their faces are assigned—dissatisfied labor and the convenient dynamite bomb. We do not propose to say what did cause the disruption, but perhaps carelessness, the latter aided by the usual preparations for ringing out the old and ringing in the new year, may have had something to do with it.

AMERICUS (Ga.) wants a gas works, and the Mayor is ready to hearken to the voice of the seeker for a franchise.

A CORRESPONDENT informs us that the "Board of Trustees of Jamestown (Dak. Ter.) asylum have decided to enlarge and extend the present electric light plant in order to cope with the requirements of recent building operations. They have accordingly contracted with the home Edison Electric Light Company for a 225-light plant. The plant now in use maintains 125 lights, and it is thought that the additional 225 lights will enable all the buildings to be electrically illuminated. The cost of maintenance, however, causes some to think that the authorities are paying rather too much for the service secured."

PUBLIC LIGHTING, BROOKLYN, N. Y.—The following proposals for public lighting, current year, have been submitted to the city authorities:

Company.	Public Lamps.	Gas to Public Buildings.
Peoples	$22.00	$1.60
Nassau	22.00	1.60
Metropolitan	22.00	1.60
Williamsburgh	21.75	1.60
Citizens	22.00	1.60
Brooklyn	19.80	1.50

The Citizens and Municipal Electric Light Companies (there is really no separation of interests betwixt them) bid $182.50 for 1,000-candle power arcs. Probably the poorest electrical illumination at present visible in any city of the world is that to be seen in the City of Churches. Two hundred candles would be an extravagant estimate of the lighting power of the lamps supplied under the grant to Fire Chief Nevins' pet companies. But it is Brooklyn, you know.

HAGERSTOWN (Md.) is still in the market for an electric light plant.

THE boom at Sioux City (Iowa) still retains all its initial vigor, and the local gas men are keeping quite near to the bandmaster.

CHEAPER GAS FOR CLEVELAND, OHIO.—The following notice was, on Dec. 26, published in the Cleveland newspapers: "In pursuance of a long established policy, the Cleveland Gas Light and Coke Company herewith announces that on and after Jan. 1, 1888, gas will be furnished to the general public at the rate of $1.20 per 1,000 cubic feet.—J. H. MORLEY, President." If we mistake not, this is the eighth concession made by the Company since 1880.

WE regret to say Mr. Jno. P. Harbison has had another, and a most severe, tussle with the disease that prostrated him about a year ago. Happily, however, his vigorous frame and steely constitution warded off the shock, although he yet bears symptoms of the severity of the struggle. Perhaps in time he can be convinced that one man ought not to strive to perform the work of three.

ANNUAL MEETING, ONEIDA, N. Y.—At the annual meeting of the Oneida Gas Light Company the following Directors were elected: S. H. Farnam, Geo. Berry, D. H. Wallrath, H. S. Klock, and W. E. Northrup.

COLUMBUS (IND.) GAS MEN STILL TO THE FORE.—Brother Keller, of the Columbus Gas Light and Coke Company, writes that his folks have nothing to complain of in regard to the Company's business records for the year just closed; and the comment applies equally to the gas and electric divisions of the Company's service. In the latter branch the Company can count 48 street lights, while the private lights number 41. The output of gas was fully up to that of '86, when all the city's lamps were maintained by the Gas Company.

BRO. KELLER also reports that his coke crusher meets with continued favor; and in support of such statement he mentions the following crusher sales made during the season: Cumberland and Elk Creek Coal Company, Meyersdale, Pa., 1; Gunnison (Col.) Gas and Water Co., 1; Nelsonville Coal and Coke Co., Ohio, 1; Austin (Tex.) Gas Lt. Co., 1; St. Bernard Coal Co., Earlington, Ky., 1; Osage Coal and Mining Co., MacAlister, Ind. Ter., 1; W. P. Rind & Co., Chicago, Ills., 3 orders; Rochester (N. Y.) Gas Lt. Co., 1; Federal Valley Coal Co., Marietta, Ohio, 1; Excelsior Gas and Coke Co., Topeka, Kas., 1; Freeport, Ills., 1; Steiwell & Co., Little Rock, ARK., 1; Canton (Ohio) American Gas Company, 1; Detroit (Mich.) Gas Lt. Co., 1; New Pittsburgh Coal and Coke Co., Chicago, Ills., 1; Huntington (Ind.) Gas Co., 1; Lynn (Mass.) Gas Lt. Co., 1; Citizens Gas Lt. Co., Jackson, Tenn., 1; and a second order from the Grand Rapids (Mich.) Gas Co. This list speaks well for the Keller machine.

HOW IS THIS FOR CHEAP GAS?—Brother Gilbert, of the Grand Rapids (Mich.) Gas Light Company, has been true to his promise of a year ago, at which time he said that if the reduction then granted was well received by the consumers (in the shape of an increased consumption by them) they might look for a similar concession at the proper date. They

took him at his word, and made no mistake in so doing, for here is the new rate, instituted on the 1st inst.:

Monthly Consumption.	Gross.	Net.
20,000 cu. ft.....	$1.20	$1.00
5,000 to 20,000 cu. ft.....	1.50	1.20
1,000 to 5,000 cu. ft.....	1.50	1.30
Less than 1,000 cu. ft.....	1.50	1.50

Bills must be paid within 15 days. The figures speak for themselves.

What Happened to Bro. Byers, of Williamsport, Pa.—On the eve of last Christmas Supt. Byers was summoned by telephone to the gas works, and although he had no fear that the holder was attempting to find the bottom of the tank, still his mind was uneasy. He reached the works at 5 o'clock, and found the men somewhat out of line, albeit smiling and happy. Before hs could launch a question Mr. Winters approached and, speaking according to rule in such situations, presented the astonished Superintendent with an elegant gold timepiece. Candor obliges us to say that, although pretty well disturbed over the event, the recipient put the watch nowhere else than in his pocket, possibly remembering that time is fleeting. He responded in a style that evidenced deep emotion and honest pleasure over what proved to him the affection in which he is held by his subordinates. The watch bears the inscription: "Presented to C. A. Byers, Superintendent of the Williamsport Gas Company, Dec. 24, 1887."

The Macon (Mo.) Gas and Electric Light Company has been incorporated. Capitalized in $24,000.

The Conshohocken (Pa.) Gas Company has reduced the price of gas to $1.75 per thousand. Old rate $2.50.

The Gloucester City (N. J.) City Council has authorized the local Gas Company to perform the public lighting for another year. Charge, $23 per lamp per annum.

Annual Election, Citizens Gas Company, Newark, N. J.—Messrs. A. A. Smalley, S. H. Condict, H. C. Kelsey, C. A. Lighthipe, J. L. Blake, E. L. Joy. H. Powles, G. A. Halsey, and Wm. Clarke have been elected to the Directorate. They, in turn, selected the following officers: Pres., A. A. Smalley; Vice-Pres., S. H. Condict; Treas., R. B. Hathorn; Sec., C. L. Nelson; Eng. and Supt., A. H. Strecker.

Using up the Scraps.

Recently a writer in the Baltimore *Sun*, alluding to the utilization at the present time of waste materials hitherto looked upon as worse than useless in certain industrial arts, specified three instances of such recovery which he has managed to find in the Monumental City. "Every resident," he writes, "can recollect the immense piles of waste tin from the can shops that used to glitter in the hollows of East Baltimore, and upon every dump in that section a dozen years ago. The first use of this waste was by a poor man from the North, who obtained permission to set up a machine in Smith & Wicks' can shop in this city. Here he bought scraps for almost nothing, and cut out tin button stock to send East. Afterward the stamps for shaping the buttons were introduced, and the individual reaped a large fortune from his enterprise. The next use of tin scrap was for smelting. The tin at first refused to flow when subjected to the heat of the furnace. It was discovered that it would pay to cut the tin coating chemically, and that the sheet iron would then smelt and flow. Out of this grew the manufacture of sash weights, and few of them are now found that are not made from tin scrap. Several foundries use all that is made. The scrap was pounded into wads by stamping it in large buckets.

"A most interesting feature of all businesses using leather is that not one particle of the leather is wasted. Our shoe factories alone sell annually 50 tons of waste. This goes mainly to a firm in Philadelphia, who pay $7 a ton for it. A large amount is sent to Lynn, Mass., and other points, where the leather is ground up, mixed with a medium, and pressed into buttons. The remainder that is not so used is treated chemically, turned into a gelatinous mass, dried, and ground into a fertilizing dust. The sole leather pieces that fall from the block of the heel stamper are sorted into two heaps. The very fine pieces are put with the fine waste. The scraps presenting a surface of a couple of square inches are barreled up and sold to parties in New York or Boston at one cent a pound, where they are put through a peculiar machine. This instrument splits the pieces nearly through; then it opens the piece thus cut like a book. Thence it is delivered from between rollers, and is large enough to be again sent to the factory to be cut up into heel lifts.

"There is another small but important industry which goes to prove how ordinary wastes of business may be turned to account. This is a work of long standing, though not generally known. In every photograph gallery there is annually a large amount of waste silvered paper. This is all thrown into a box and is bought or exchanged for nitrate of silver. The comparatively small amount collected in one gallery aggregates a great mass when all the galleries are considered. This paper is burned, and the silver that is extracted from the residue pays sufficiently at least for a good living. The time was, not very remote, too, when the coal tar from gas houses was a nuisance in every harbor. Now every bit of the tar is utilized, and some of the finest dyes ever known are made from it."

Notes from the West.

By Retort.

The Chicago (Ills.) gas situation seems to be in as unsettled a condition as ever, and a very pretty fight is on concerning the compromise offered by the Trust. The basis of this was to furnish gas at $1.20 per thousand, but the proposition has been laid on the table by the "powers that be." In the meantime the one-sided onslaught of the press goes noisily on. The loud threat of the city to build its own gas works has simmered down to an effort to incorporate another company as a competitor to the Trust, and it would not be at all surprising should another company be so admitted.

H. E. Clarke, who resigned the Superintendency of the Kansas City (Mo.) Gas Light and Coke Company some time ago, was thoroughly surprised by his former employees during the Christmas holidays. The conspirators invited their former manager to visit the gas works, and upon his arrival presented him with a magnificent set of silverware, which is likely to be a thing of beauty and a joy forever in the Clarke household. The genial recipient was completely taken aback, but speedily rounded to in a most appropriate speech of thanks.

On Jan. 9 a terrific explosion destroyed the purifying house of the New Albany (Ind.) works. Loss, $9,000; no one hurt; cause not yet traced out.

Omaha Mother.—So your daughter is engaged? Council Bluffs Mamma.—Yes; she is to marry a Council Bluffs gentleman. First person.—Is he well off? Second Person.—I should say so. He owns half a share of gas stock. Ah, indeed!

The Flint (Mich.) Gas Light Company has decided to put in an electric lighting plant; and the Swift Electric Light Company, of Bay City, Mich., has ceased to supply light to the citizens. Cause, no money in it.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Comparisons on the Cost of Electric and Gas Lighting.

St. Louis, Mo., Jan. 9, 1888.

To the Editor American Gas Light Journal:

Dear Sir:—Allow me to herewith send you some figures and remarks on the cost of electric lighting; and also on comparative cost of gas lighting.

In looking over the discussion of the paper, read by Mr. King, of Jacksonville, Ills., before the last meeting of the American Gas Light Association, as reported in the Journal of Nov. 16, 1887, I notice it appears that, while Mr. King, Mr. Neal and Mr. Nettleton are getting respectively about the same price for gas, there is a wide difference in their respective charge for each arc light. For instance, Mr. King gets about $7 per month, or $84 each, per year; Mr. Nettleton gets $6,000 for 90 lights, or $66.66 each, per year; and Mr. Neal gets 50 cents per night, or $15 per month, or $180 each, per year. Mr. King says he is paying satisfactory dividends; Mr. Nettleton says he will not be satisfied until he makes 16 per cent. on his plant; and Mr. Neal says, "The business has been carried on *financially* and practically with great success." Indeed, it would seem as if there could be no doubt of Mr. Neal's financial success, when he is charging nearly three times as much for an arc light as that charged by his neighbor, Mr. Nettleton.

Now, although Mr. Nettleton is using water power he is paying for it about as much as coal would cost. It appears, from the workings of the plant at the Central Depot, Cincinnati, Ohio, and from statistics concerning other like plants, that one pound of coal or coke is required to run one 16-candle power glow lamp for one hour; and as one arc light is equal to 8 glow lamps of 16-candle power, it follows that 8 pounds of coal per hour are required in the production of one arc light.

On the above basis the cost of running a street arc lighting plant rated to a duty of 100 lights, estimating on a schedule of 3,000 hours per year, would be—

3,000 hours × 800 lbs. of coal per hour = 2,400,000 lbs., or 1,200 tons, which, at $2 per ton	$2,400 00
It will take 3 carbons per lamp per 12 hours, or 1 carbon per lamp for each four hours, or 750 carbons for each lamp per year, or for the 100 lamps per year, 75,000 carbons, which, at $15 per 1,000, gives	1,125 00
One engineer, at $60 per month	720 00
One fireman, at $50 "	600 00
Two trimmers, at $45 each per month	1,080 00
Superintendent, at $50 per month	600 00
Oil, waste and incidentals	200 00
Water rates	100 00
Interest on plant ($20,000, at 6 per cent.)	1,200 00
Depreciation (8 per cent. on $20,000)	1,600 00
Taxes	300 00
Total	$9,925 00

or $99.25 per light per year.

Now, if one arc lamp costs $99.25 per year—always remembering the ratio as agreed upon between the varieties—then the cost of one 16-candle glow lamp will be one eighth of $99.25, or $12.40 per year, *plus* the difference between the cost f the renewal of glow lamps and the cost of carbons for the arc lamps.

Substituting 800 glow lamps for the 100 arcs, and running them 3,000 hours per year per lamp, would give 2,400,000 hours for one glow lamp. Hence, the life of one lamp being placed at 600 hours (maximum or even average duty considered, this is a high estimate), we would have to employ a total of 4,000 glow lamps in the year. In other words, each of the 800 lights would require to be renewed five times within the twelve-month. Therefore—

4,000 glow lamps (at 50 cents each) means an expenditure of	$2,000 00
Cost of carbons for the 100 arcs	1,125 00
Excess of cost of glow lamps over carbons	875 00

—*i. e.*, $875 on 800 lamps, or about $1.10 each. Add cost of lamps to operating, and we have $13.50 per year as the result of maintaining each 16-candle power lamp. [I have placed the cost to the consumer of glow lamps at 50 cents each; but the actual expense is much higher, ranging from the *minimum* (50 cents) to $1 apiece.]

Now, the quantity of coal gas required to produce an equal quantity of illumination, when burned through the common batwing burner, would be—

800 burners × 5 cu. ft. of gas × 3,000 hours = 12,000,000 cu. ft.

The cost of the 12,000,000 cu. ft. of gas can of course be (with coal at $2.50 per ton of 2,000 lbs.) easily figured out to precision, for then we are on familiar ground. First, we will figure on the residuals receipts from a net ton of the $2.50 coal:

20 bushels coke, at 7 cents per bushel	$1 40
10 gallons tar, at 5 cents per gallon	50
25-gallons 8-ounce liquor, at 1 cent per gallon	25
Total	$2 15
Less cost ½ bushel of lime	15
Or, net	$2 00

Deducting $2 from the $2.50 charge for first cost of coal, leaves 50 cents as the net cost of the coal and lime materials to be charged against a production of 10,000 cu. ft. of gas, or at the rate of 5 cents per 1,000 cu. ft of a 16-candle power article. To the materials charge we can add, per 1,000 cu. ft. for labor and attendance, 12½ cents, or a total of 17½ cents per 1,000 cu. ft., to cover the items of coal, lime, labor and superintendence. Then—

12,000,000 cu. ft., at 17½ cents per thousand	$2,100
Interest on plant investment ($30,000 at 6 per cent.)	1,800
Depreciation (4 per cent. on $30,000)	1,200
Water rates	100
Taxes	450
Total	$5,650

Hence we have $5,650 as the cost of the 12 million cubic feet of gas, against $9,925 for an equal amount of light produced by electricity, showing a difference in favor of gas of $4,275, or 43 per cent.

The difference in favor of gas for street lighting would be still greater, because one arc lamp will not displace eight 5-ft. gas lights.

The cost of gas is estimated from the cost of the same as manufactured in our large cities. Of course, in smaller centers the expense would be greater, the difference depending largely on the price of coal and the value of residuals. On the other hand, the cost of electric lighting would also be larger than the estimate here made in places where fuel and labor were more expensive, and where a fewer number of lights were in use.

Again, the expense of gas to the consumer will be very materially reduced by the use of high-candle power burners on the regenerative and incandescent types, various forms of which are freely offered to the trade. Those on the Siemens plan are now to be purchased at 50 per cent. less than formerly: while those in interest claim it has been fully demonstrated that the Welsbach incandescent burner will, with a consumption of 3 cubic feet per hour, give as much light, the gas being of the same quality, as 5 cubic feet burned through a batwing or Bray tip. Further, the parties who control the Welsbach will guarantee that the burners can be made for 50 cents each, the life of the mantle to last 1,000 hours. In its life of that duration the 3-foot Welsbach would consume 3,000 cu. ft. of gas, and, at 50 cents each, the charge for renewal of burners would be equal to 16⅔ cents per thousand cubic feet. If the price of gas to the consumer is $2 per thousand, the saving between 3 and 5 cu. ft. per hour is equal to 40 per cent., or 80 cents per 1,000 cu. ft. consumed, less the cost of the burner (16⅔ cents per 1,000 used), or a net saving to the consumer of 63⅓ cents per thousand. If gas were sold at $1.50 per thousand the saving would be 60 cents, less 16⅔ cents, or 43⅓ cents per 1,000 cu. ft.

From the above estimates it will be seen that the cost of renewing the glow lamps is identical with that in the case of the Welsbach variety—that is, 16⅔ cents per 1,000 cu. ft., or the equivalent of 1,000 cu. ft.; but there is 40 per cent. saving of gas in favor of the latter.

The pronounced disadvantages of incandescent electric lighting include the expense for renewal of lamps, which is equivalent to from 16⅔ cents to 33⅓ cents per thousand on gas. I have estimated the cost of a Welsbach burner at 50 cents, but this is probably too high, because the burner proper, like the bodies of the lava-tip burners, will last for years, while the mantle of the Welsbach, as with the lava-tip, can be replaced at a small cost. The selling price will be about $2 for the body, and from 10 to 15 cents each for the mantles.

If the demand for residuals should decrease, as undoubtedly would be the case if all the lighting and much of the heating were performed with coal gas, then, in that event, a portion of the duty could be thrown upon water gas. Under the revailing low prices water gas can in some parts of the country be manufactured as cheaply as coal gas—the item of labor in the manufacture of water gas is about one third of the cost of labor in making coal gas.

The cost of oil (say, in Ohio) is 1½ cents per gallon, and a ton (2,000 lbs.) of anthracite is worth $5, while we may put the cost of labor at 4 cents per 1,000 cu. ft. of gas made. Hence 1,000 cu. ft. of a 20-candle power water gas would cost—

4½ gals. oil, at 1½ cents per gallon	$ .06¾
40 lbs. coal, at 25 cents per 100 lbs.	.10
Fuel for boilers, say	.01½
Labor	.04
Total	.22

Thus we have 1,000 cu. ft. of 20-candle power water gas at a cost of 22 cents, as against an equal quantity of 16-candle power coal gas obtained at a cost of 17½ cents; or, taking light for light, about an identical result.

While the demand for residuals is as good as is the case at present there is no occasion for coal gas companies, possessed of a plant of sufficient capacity to meet all present demands, to go to the expense of putting in a water gas annex; but if it is proven practicable to introduce into general use a gas burner as economical as the Welsbach is said to be, then all gas companies will be obliged to increase their capacity to cope with the increased demand for light that will be made upon them. The increase of 40 per cent. in light from an equal quantity of gas would double the number of consumers in many places, besides creating a demand for more light from those already using gas, the addition from both sources being more than ample to compensate the gas manufacturer for the original 40 per cent. reduction in quantity sold because of the greater economy of the new burner.

The cost of gas coal along the Ohio river is much less than $2.50 per 2,000 lbs., but the price of gas coke is also correspondingly less, and hence the net cost of coal in gas making will vary but little in different localities.

I hope that this effort to compare the first cost of gas and electricity may induce others to give your readers more and better information on the subject. Very truly yours, SYLVESTER WATTS.

The Market for Gas Securities.

There is nothing of importance to note in connection with either the New York or Brooklyn gas share market. When it is said that quotations are all on the investors' side of the market the history of the fortnight has been written up. But little inquiry for shares has been manifested, and although the brokers are bitterly lamenting over a lack of orders, investors seem to be satisfied. Chicago Trusts are weaker, having been offered down to 37¼. Baltimore Consolidated has stiffened up a trifle, and despite the frequency of rumors that the rate war will be renewed we venture the opinion that a good turn can be made on the purchase of these shares at current rates. Boston gas sold at 170 on the 4th, at which figure 6 shares changed hands, and some days later a similar figure was obtained for a lot of 10 shares, the latter transaction being followed by a forced transfer of 3 shares at a shade over 167. Other Eastern sales were the following: 13 Cambridge, at 175¼; 2, do., at 176¼; 2 Charlestown, at 95½; 10 Salem, at 111¾; and 20 Newburyport, at 104; and 5, at 103. Also 5 Marblehead Gas and Electric Light, at 109¾. The New Bedford (Mass.) Company declared a 4 per cent. dividend, adding thereto 2 per cent. from the insurance. The Pottstown (Pa.) Company is now paying a 5 per cent. dividend. Montreal gas has been somewhat active—between 207¼ and 209¼.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St. New York City.

January 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	76	—
Central	440,000	50	30	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	110	—
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	90	93
" Bonds	1,500,000	1000	101	—
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	50	—
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	100	103
Citizens	1,200,000	20	52	55
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	128	130
" Bonds	300,000		—	106
Peoples	1,000,000	10	60	62
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	75	80
Nassau	1,000,000	25	90	95
" Ctfs	700,000	1000	95	100
Williamsburgh	1,000,000	50	112	115
" Bonds	1,000,000	—	111	—
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	165	170
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	140	145
" " Bonds.	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	37½	38
Cincinnati G. & C. Co.	6,000,000	100	178	180

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Best Adapted and Most Successful Method of Gas Lighting Ever Offered.

The SOFTNESS AND PURITY OF THE LIGHT make it most desirable for Office and Household Uses. Its BRILLIANCY and POWER render it unrivaled for lighting Halls, Churches, etc. Its ECONOMY secures for it general favor wherever used.

NOTICE.—Suits are pending in the United States Circuit Courts in Illinois and Pennsylvania against various parties for infringement of our Letters Patent No. 247,925, dated October 4, 1881, and No. 333,862, dated January 5, 1886. The first of these suits has come up for hearing, and an injunction has been granted therein. The second of said suits has not yet been reached for hearing. All persons are cautioned against manufacturing, selling, or using any apparatus or material which infringes our patents. We intend to prosecute all parties infringing patents owned by us.

ALBO-CARBON LIGHT CO. (Sole Manufacturers for the United States) **Main Office, Newark, N. J.**

To All Whom It May Concern!

The SIEMENS-LUNGREN COMPANY hereby warns the public against the use of various infringing Regenerative Gas Lamps which are offered for sale. This Company has heretofore delayed bringing suit to enjoin the manufacture or importation of such infringing lamps, solely because of the practical worthlessness of the infringing devices; and although, in each instance, they infringe some one or more of the various patents owned or controlled by this Company, they have fallen into disuse sooner than any suit could be brought to a hearing. As, however, the introduction of these infringing lamps has tended to discredit the practicability of our Company's system of regenerative gas lighting, we have instructed our Attorneys, Messrs. Geo. Harding, C. S. Whitman, and Silas W. Pettit, to give notice that legal proceedings will in future be taken against all such infringers.

THE SIEMENS-LUNGREN CO., 21st St. & Washington Av., Phila., Pa.

The Walker Tar and Carbonic Acid Extractor.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractar has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledom Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, Esq., of the Dundalk Gas Works.

Also to the Engineers of the Imperial Gas Association at Antwerp, Amsterdam, Brussels, Frankfort-on-the-Main, and Aix-la-Chapelle Gas Works; to Dr. T. H. Van Doesburch, of the Rotterdam Gas Works; A. F. Spruyt, Esq., of the Utrecht Gas Works; M. Mallema, Esq., of the Zwolle Gas Works; G. Deronde, Esq., of the Leeuwarden Gas Works; the Engineer of the Kampen Gas Works, Holland; C. Pouchain, Esq., of the Gas Works at Rome, Italy; and to A. Normanton, Esq., of the Campinas Gas Works, Brazil.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

Mr. Thomas Littlehales, of the Hamilton (Ontario) Gas Light Company, writes as follows, under date of Dec. 28, 1887:

"Last summer we erected at these works a C. & W. Tar and Carbonic Acid Extractor, which is doing really excellent service. It works admirably, diminishing the duty of the purifiers and allowing them to run longer, purifying more gas per bushel of lime."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company. It can be manufactured in the following sizes:

No. 1	50.000 to	100,000	cubic feet	per	Twenty-four	hours,	3	feet	square,	5 feet deep.
No. 2		125,000	"	"	"	"	4	"	"	" "
No. 3		250,000	"	"	"	"	5	"	"	" "
No. 4		500,000	"	"	"	"	6	"	"	" "
No. 5		750,000	"	"	"	"	7	"	"	" "
No. 6		1,000,000	"	"	"	"	8	"	"	" "
No. 7		1,250,000	"	"	"	"	9	"	"	" "
No. 8		1,500,000	"	"	"	"	10	"	"	" "
No. 9		2,000,000	"	"	"	"	12	"	"	" "
No. 10		3,000,000	"	"	"	"	15	"	"	" "

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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The results obtained by this Process are far better than those obtained by any other apparatus, especially where an illuminating gas of high candle power or a fuel gas of intense temperature is required.

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Newton Illuminating Co.	Newton, Kansas.
Wellington Light and Heat Co.	Wellington, Kansas.
Chippewa Falls Gas Light Co.	Chippewa Falls, Wis.
Elkhart Gas Light and Coke Co.	Elkhart, Ind.
Madison City Gas Light Co.	Madison, Wis.
South Bend Gas Light Co.	South Bend, Ind.
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Salina Gas Light Co.	Salina, Kansas.
The Rathbun Co.	Deseronto, Prov. Ont.
Jefferson City Gas Light Co.	Jefferson City, Mo.
Mankato Gas Light Co.	Mankato, Minn.
Minneapolis Gas Light and Coke Co.	Minneapolis, Minn.
Lima Gas Light Co.	Lima, Ohio.
Bellevue Water and Fuel Gas Light Co.	Bellevue, Campbell County, Ky.
Bucyrus Gas Light and Fuel Co.	Bucyrus, Ohio.
Morris Gas Co.	Morris, Ill.
Los Angeles Gas Co.	Los Angeles, Cal.
San Diego Gas Fuel and Electric Lt. Co.	San Diego, Cal.
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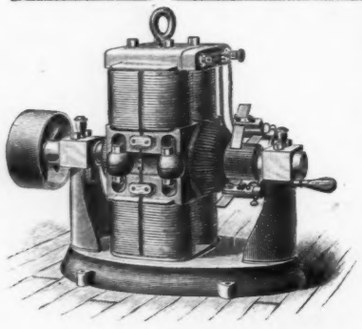

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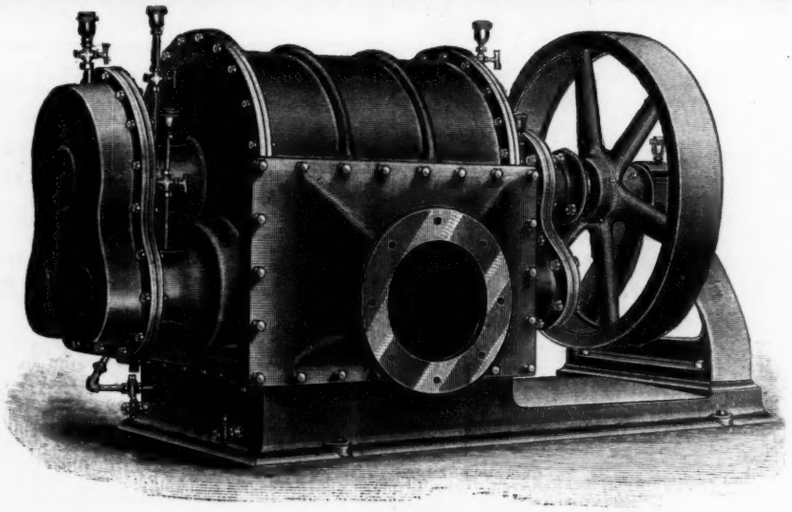

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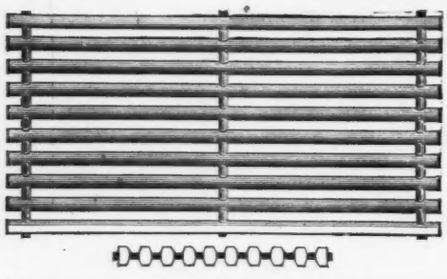

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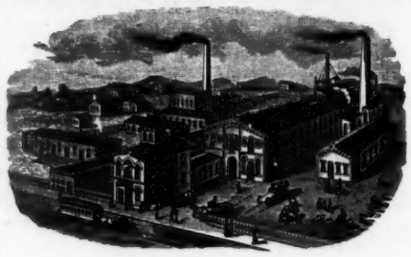

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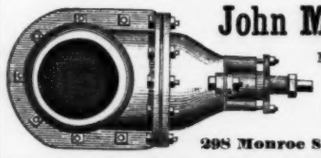

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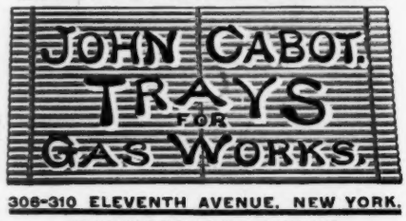

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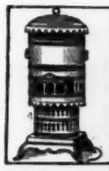

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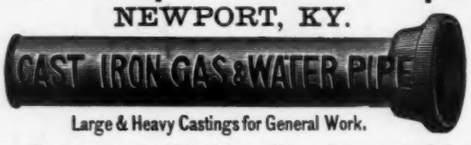

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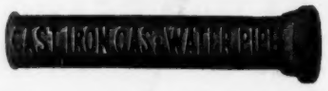

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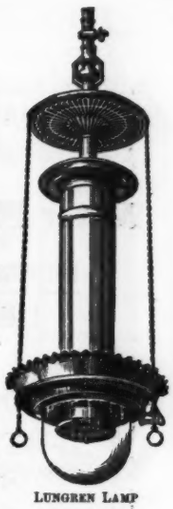

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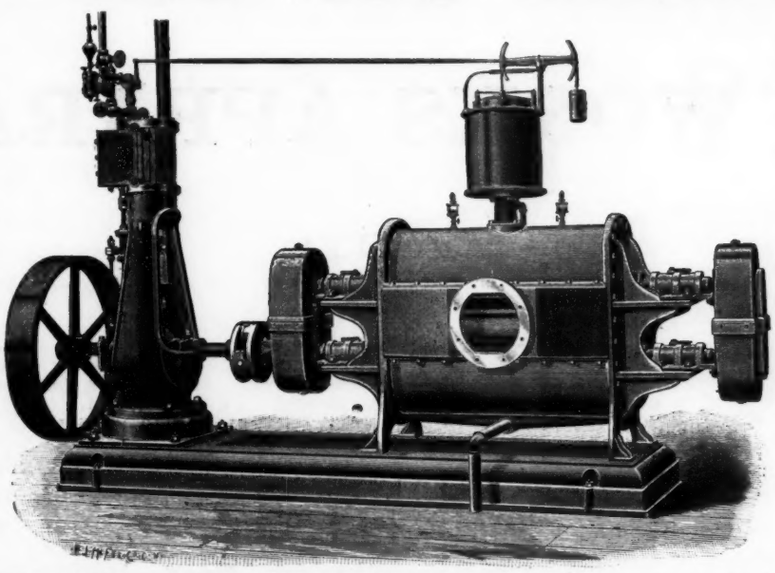

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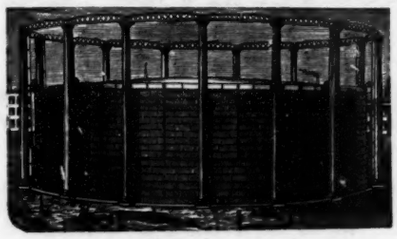
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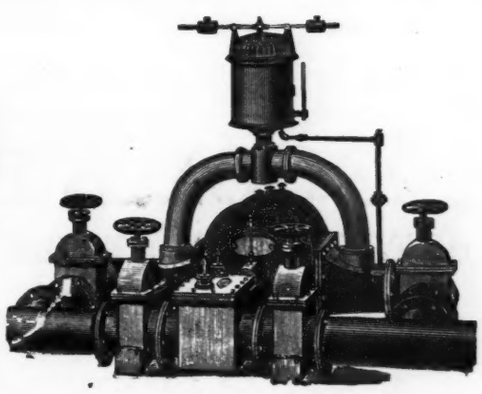

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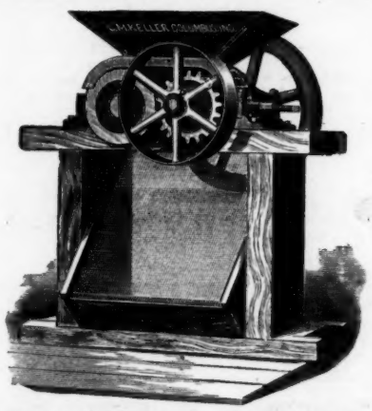

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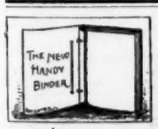

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